modeler3D

A 3-D Object Generation System

For the AMIGA® Family of Computers

AEGIS

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Table of Contents

Introduction

Welcome to Modeler 3D - the best tool to give your imagination a new dimension! The 3D world of the Amiga family of computers is an exciting place. Not only can professional quality animations and effects be produced in a fraction of the time previously required, but also at a fraction of the cost. More expensive, "high-end" graphic systems may produce a cleaner image, but for sophisticated low-cost animation, the Commodore Amiga provides an excellent solution.

In July of 1987, Aegis Development, Inc. released VideoScape 3D version 1.0. The author, Allen Hastings, had created one of the top selling animation packages for the Amiga. VideoScape 3D was immediately put to good use in all types of production and post production facilities. Ad agencies, design houses, even movie and television production used VideoScape 3D for on and off screen work.

With powerful features like 4096-color animations, transparent polygons, and hierarchical motion, animations were made copying those done on the "high end" systems, many appearing so much like the original that it was hard to tell the difference. The only problem was the level of sophistication. Since most programs concentrated on the results, the method for getting them was not always an easy one.

Enter, Modeler 3D - filling the need for sophistication with an interface that is easily understood, Modeler 3D allows control over almost every aspect of object design. An object such as a bicycle wheel complete with spokes, for example, can be produced in just a matter of minutes by pointing and clicking in the three viewing windows. It provides the tools and the resources to get results quickly and precisely.

Using This Manual

This manual has been written and edited to make learning how to use the program an easy task. With this in mind, we suggest that you read through **Chapter 1: Getting Started**, and **Chapter 2: The Modeler 3D Universe**, before you start the **Tutorial** in **Chapter 3**. These sections contain information you must know in order to use this program to it's full potential.

If you prefer a more methodical approach, or if you just want to experiment with Modeler 3D, read **Chapter 2: The Modeler 3D Universe**, and then

go ahead and explore. The manual describes Modeler 3D by types of commands in the chapters following the Tutorial.

If you are really an Amiga pro and have experience with VideoScape 3D, read **Chapter 2: The Modeler 3D Universe**, then turn to **Appendix D: Menus and Keyboard Commands** for a reference list of the menus and commands accessable via the keyboard. Also, check **Appendix E: Advanced User Tips**, for some good hints and shortcuts.

CHAPTER

1 Getting Started

In this chapter:

What You Need To Run Modeler 3D

Modeler 3D will run on any of the Amiga family of computers with minimum requirements of:

- **512K RAM.**
- **One disk drive.**
- **Workbench Versions 1.2 or greater (an Amiga 1000 requires Kickstart version 1.2 or greater).**

Additional RAM and a hard disk is highly recommended. With 512K you will have to close each window before working on another one.

What You Should Already Know

Prior to using Modeler 3D, you should be familiar with the following terms and items. If you are

unsure about any of these, please refer to your *Amiga Owner's Manual* for a complete description.

- **click**
- **close gadget or close box**
- **double-click**
- **dragging**
- **front-back window gadget**
- **gadget**
- **menu**
- **Menu mouse button (RIGHT)**
- **Selection mouse button (LEFT)**
- **scroll bar**

The rest of Modeler 3D's terminology is explained in **Chapter 2: The Modeler 3D Universe.**

Making A Backup

You should also know how to back up your Modeler 3D disks. **Do so at this time.** Or, if you have a hard disk, copy the Modeler 3D files onto it now.

To make a backup with one disk drive:

Make sure you have a blank, double-sided disk ready to copy to.

Note: Never remove a disk while the red drive light is on.

- Insert Workbench 1.2 in the drive.
- On the Workbench screen, choose **Duplicate** from the **Workbench** menu.

  A requester will appear asking you to insert the **From** disk in the drive.

- Remove the Workbench disk and insert the Modeler 3D disk.
- Click on **Continue** with the Selection button.

  After a moment, a requester will appear asking you to put the **To** disk in the drive.
- Remove the Modeler 3D disk and insert a blank, double-sided disk in the drive.
- Click on **Continue** with the Selection button.

  You will need to swap disks a few times to complete the disk copying process.

To make a backup with two drives:

You should be in the Workbench screen for the following steps.

- Insert a blank, double-sided disk in the external drive.
- Use the Selection mouse button to drag the **Workbench** disk icon over the **DF1:** icon and release the Selection button when the **DF1:** icon turns black.

  A requester will appear saying **Put FROM disk in drive DF0:**.
- Remove the Workbench disk and insert the Modeler 3D disk.

4) Click on **Continue** with the Selection button.

To put Modeler 3D on a hard disk:

- At the Workbench screen drag all the icons on the Modeler 3D disk to the area of your hard disk where you want to keep them.

  You may want to create a new drawer just for your Modeler 3D program and files. Refer to your Workbench Manual for details on how to do this.

Loading Modeler 3D

To start Modeler 3D from the Workbench:

- Insert the program disk in the internal drive when you are asked for a Workbench disk. Modeler's Workbench screen will appear.

Note: The Amiga 1000 requires a Kickstart disk version 1.2 or greater.

- Double-click with the Selection mouse button on the **Modeler 3D** disk icon.

  A window will appear containing more icons.

- Double-click with the Selection button on the **M3D** icon.

  After a few moments, Modeler 3D's editing windows will appear displaying **TOP**, **FRONT**, and **LEFT** views.

To start Modeler 3D from the CLI:

- Insert the Modeler 3D program disk.
- At the Workbench screen, double-click on the CLI icon.
- At the CLI prompt (1>), type **M3D**.

  After a few moments, Modeler 3D's editing windows will appear.

Using the Storage Requester

Modeler 3D uses a standard storage requester for saving and retrieving files (object files, palettes, etc.).

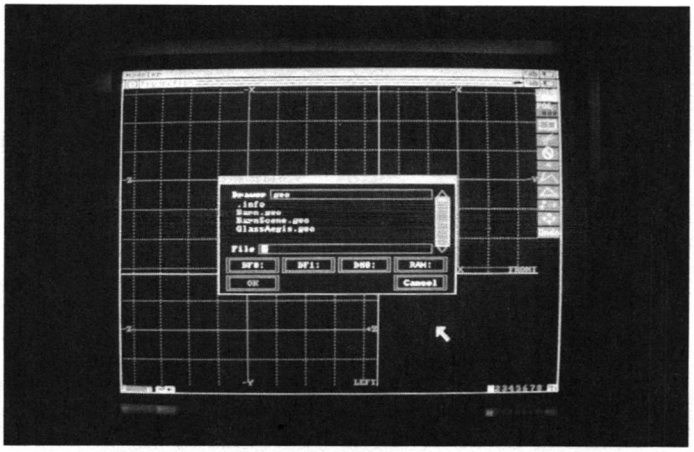


Figure 1.1: The Storage Requester

There are several ways to enter information in the storage requester. One way is to type the information directly in the edit fields. Click in the

field you wish to change and type the new information — you may have to erase old information with the BACKSPACE or DEL keys first — then press RETURN. As an example, if you wanted to load a spaceship file in the "geo" drawer on a data disk in the external drive, you would enter in the **Drawer** edit field: **DF1:geo** and press the RETURN key. If you only have one drive, you would type **DF0:geo**, swap disks, and then press RETURN.

The **File** edit field shows which file you have selected from the list. Here, you can type in the name of a new file you are saving.

You can also enter information in the storage requester by using the mouse. Select the button of the disk directory you want, for example **DF1:**, and the list will change to show the drawers (directories) and files on that disk. Drag the scroll bar or select the up and down arrows to scroll through the list. Click on a drawer to see its contents. When you click on a file you want, it will appear in the **File** edit field. Select **OK** to load the file.

The About... Option

Choosing this option from the **Project** menu will display the author's name, the version number of Modeler 3D, and the current RAM status.

Quit...

Choosing this option from the **Project** window will exit Modeler 3D and return to the Workbench screen. It will ask you if you've saved your work and give you the option to do so.

Keyboard Commands

Many of the menu items can be chosen when you press certain keys or combinations of keys. A keyboard combination consists of a key or several keys that you are to hold down while you press another key. For example, Amiga-O (Open a file) would be accomplished by holding down the right Amiga key and pressing O (on some machines these are replaced by Commodore keys, but we will refer to them as Amiga keys in this manual). You'll find a complete list of Modeler 3D's keyboard commands in **Appendix D: Menus and Keyboard Commands.**

CHAPTER

2 The Modeler 3D Universe

In this chapter:

- **Screen Layout**
- **Display Gadgets**
- **The Tool Bar**
- **Modeler 3D Terminology**
- **Selection Modes**
- **Copying**
- **Deleting**
- **Undo**

Before you begin experimenting with Modeler 3D or exploring the Tutorial, please take a few moments to read this section from start to finish. You need to know the information here in order to do anything with Modeler 3D. Even if you are the daring type who likes to fiddle around with a program before reading the manual, we highly recommend that you read this chapter first.

If you are unfamiliar with how three-dimensional drawing works, or if you are unsure of the terminology used to describe 3-D objects (height, width, length, origin, volume, point, polygon, etc.), turn to **Appendix A: Orthographic Projection**, and **Appendix B: Thinking In 3D**, for detailed explanations.

Screen layout

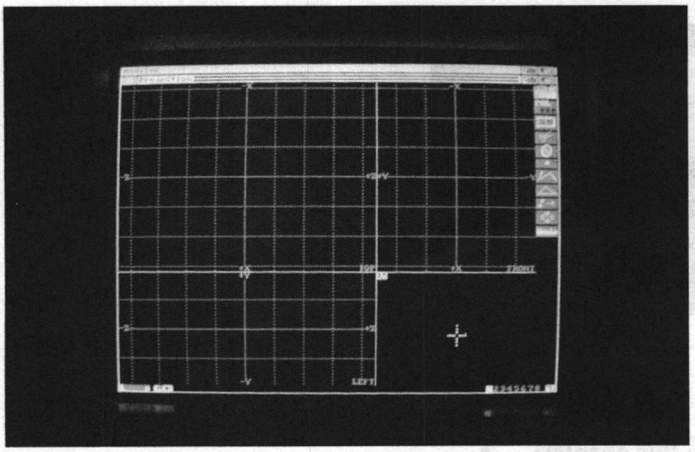
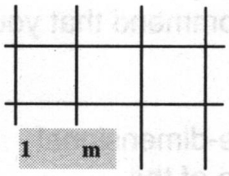


Fig. 2.1: The Projection window, Lock gadget, Tool bar, and Menu.

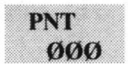
When you start Modeler, you'll see the menu bar and the **Projection** window, with its Tool bar and display gadgets. You can use the tools to build objects in this window or the **Template** window (one of several different windows you can open). Then you can make changes to the objects with editing commands from the menu. Here is a brief description of each area:

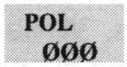


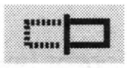
The Grid gadget.

Display Gadgets

Normally, you work in two views simultaneously to define all three dimensions of your objects. The Lock Plane gadget lets you confine your work to one view, as if you were working in a 2-D drawing program. Another way you can simplify your work is to break up complicated objects and put the pieces

Point Mode 

Polygon Mode 

Volume Mode 

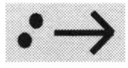
Cut 

Delete 

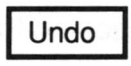
Point 

Curve 

Polygon 

Move 

Pan 

Undo 

in different drawing layers, then when you're done working on them, you can put them back together in one layer. The Layer gadgets let you choose which layers to display (you can display more than one). You can also choose which layers are ~~active~~ foreground — only ~~active~~ foreground layers are affected by editing commands. The Grid gadget indicates the current scale (in the previous picture the gadget shows that each block is 1 meter by 1 meter). This gadget also activates X-Y-Z readouts of the cursor's position.

The Tool Bar

The Mode selection tools let you choose a level at which to work: in Point Mode, your commands affect points, in Polygon Mode they affect polygons, and in Volume Mode they affects either points or polygons or both enclosed in a defined area.

The Cut tool removes a chosen part of the display and copies it to another layer, the Delete tool removes it altogether. The Add Point tool is for creating points, the Curve tool is for creating two-point polygons (straight or curved lines), and the Add Polygon tool is for creating polygons on chosen points. The Move Points tool will shift a point or a group of points. If you run out of space, you can use the Pan tool to scroll over to a new area. And, if you want to reverse your last action, you can select **Undo**.

Modeler 3D Terminology

It is important to understand a few terms that Modeler uses to describe things. While most all of them are everyday English, some different meanings apply.

Layer(s) - Modeler allows 8 different layers (or work spaces) to be used for object editing. Each layer can be a foreground or background and have its own center of rotation.

Active - The term "active" in Modeler is used to describe the set of points and/or polygons enabled for modification. The active items are determined by what points and polygons are selected, and the current editing mode.

Foreground - A layer is considered a foreground layer when it is displayed in white. This means the contents of that layer may be edited.

Background - A background layer is the contents of another layer which has placed behind the foreground layer(s). The background layer is always displayed in blue and will not be affected by editing commands.

Normal - A normal is a small dotted line which will appear at a right angle to selected polygons. It is used to indicate a direction the polygons are visible from.

Blank space - Refers to anyplace on the screen where there is no grid.

REFERS TO ANYPLACE IN THE WINDOW WHERE THERE IS NO GRID OR GADGETS, SUCH AS BELOW THE TOOL BAR

Vertex/Vertices - A vertex is best described as a corner point. A point is used to represent each vertex of an object.

Plane - A plane is a two-dimensional flat surface. This can also be thought of as a "slice" through 3-D space.

Planar - A polygon is planar when all the vertices lie in a plane. If polygons are not planar, they may not be rendered correctly in VideoScape 3D.

Universal - These commands affect active items in foreground layers.

Direct - These commands affect selected points or polygons regardless of the mode (see **Selection Modes below**).

Edit Field - A box inside of a requester for entering data.

Text Cursor - The edit field cursor.

Selected Points - Those points highlighted in the editing window.

Selected Polygons - Those polygons highlighted in the editing window.

Aegis Draw Family - This reference is used wherever Aegis Draw, Aegis Draw Plus, and Aegis Draw 2000 can be used.

Selection Modes

There are three selection modes: Point, Polygon and Volume. They are all different, but they all work together in a complementary way. The first two modes are necessary since points and polygons are very different things and cannot be selected in the same way, nor do they respond to the same sorts of operations. The other mode, volume mode, is for speed and efficiency.

Since points are just coordinates in space, they can only do three things: they can be created, deleted and moved. Ways of moving points around include translation, rotation, scaling, remapping, etc. These types of systematic motions are called "transformations."

Polygons can be created and deleted, but they cannot be moved. The points which are its vertices can be moved, however. Imagine points as "hooks" floating in space and polygons as "rubber bands" stretched tightly between a set of these hooks. The area enclosed by the rubber band is the visible area of the polygon. Polygons cannot themselves be moved, but the hooks can be, and moving a hook may affect several polygons (all those which use that point as a hook).

As well as being created and deleted, polygons can be colored and flipped, can have vertices removed or added, and can be split or merged. These last five operations can only be performed on selected polygons using direct edit commands in Polygon Mode.

Volume Mode selects points and polygons at the same time. Points selected are those that lie within the volume. Selected polygons lie completely within the volume (that is, their vertices are all selected points). The polygons that span the border of the volume are either selected or not depending on the volume mode. In Exclusive Mode (dashed volume borders) these spanning polygons are not selected. In Inclusive Mode (solid borders), they are selected.

The operations **Cut**, **Delete** and **Copy**, as well as the **Modify** menu options, **Rotate**, **Translate**, **Scale**, **Remap**, **Merge Points**, **Quantize**, **Change Color**, **Mirror** and **Array**, are universal commands and all act on the active points and/or polygons. What does that mean? If you're in any of the three modes — Point, Polygon or Volume — the program looks at what you've selected in that mode to determine what to act on. So, if you are in Point Mode and you have selected some points which are now highlighted, any of the above operations will act on those points and no others. If you have not selected any points, the operation will act on all the points and polygons in the foreground layer(s).

Why have an operation act on everything when you have nothing selected? Convenience. Since it is more common to want to have an operation affect everything all at once, it makes sense to have an easy way of doing it.

The same rules apply to Polygon Mode and Volume Mode. In each, an operation acts on anything specifically selected for this mode, or on the whole layer if nothing is selected. So in Polygon Mode,

the operation affects the defined polygons or everything, and in Volume Mode, the operation affects the points and polygons selected by volume, or everything if no volume is drawn.

But there is some subtlety to this. The transformation operations affects only active points, so if you select some polygons in Polygon Mode and try a transformation operation such as **Rotate** or **Quantize**, nothing will happen because no points are active, only polygons.

Several operations make copies of the active items (points and/or polygons). The **Copy** option, for example. If you choose **Copy** when nothing is explicitly selected (so that everthing in the layer is selected), then the object in the foreground layer(s) will be copied exactly — each point and polygon will be duplicated in the result. If you choose **Copy** when some points are selected in Point Mode, however, then only these selected points will be copied, and no polygons at all.

Now, if you choose **Copy** while you have polygons selected in Polygon Mode, the polygons will be copied. The problem with this is that you can't have just a polygon — you also need its points in order for the polygon to exist at all. So when polygons get copied, some points also get copied, but only those necessary to support the copied polygons and no others. So, if you select a single polygon in Polygon Mode and **Copy** it into an empty layer, you will see that some points also got copied — those points which were exactly the vertices of the copied polygon. If you **Copy** a volume, you will end up

with a copy of the points and polygons selected by the volume frame. So not only do polygons and their associated points get copied, but also points not associated with any polygon which lie within the volume.

Deleting is also a little tricky. Deleting polygons just unhooks the rubberband and throws it away. Deleting points is like deleting hooks — any rubberbands that were stretched around a deleted hook snap into a different shape. If all the points of a polygon are deleted, the polygon itself goes away (the unhooked rubberband twangs off into space...). If one vertex of a triangle gets deleted, the polygon will snap into a two-vertex configuration — a line. The danger in deleting points is that you may create unwanted one- and two-vertex polygons. These can be troublesome since these polygons are not readily visible in the **Projection** window but they can mess up a VideoScape 3D rendering. One of the uses for the **Statistics** window is to provide a way to see one- or two-point polygons in an object and delete them easily.

There is a lot of power in the **Undo** command. Along with reversing you last action, you can use **Undo** to travel from one window to the next after making a change. If you decide you don't like the change in another view, you can return to your original window and **Undo** it.

CHAPTER

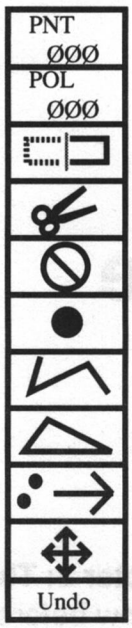
3 A Complete Tutorial

In this chapter:

If you have not yet read **Chapter 2: The Modeler 3D Universe**, please do so now before you begin this Tutorial. It contains important instructions on how Modeler 3D works.

You should set aside about one hour for this Tutorial, as there are parts you may want to experiment with on your own. The approximate time for completing all the steps is 45 minutes.

In this Tutorial you'll use each of Modeler 3D's features. Part One will take you step by step through creating an object: a barn. We chose this object because it is an easy shape, yet requires the use of many of Modeler 3D's functions. Part Two creates a silo for the barn, and utilizes the functions you've learned in Part One while quickly taking you through another object creation. Part Three is a brief outline of how to create a camera motion file for use in VideoScape 3D. When you're finished, you'll be ready to go on to create anything you want



with a complete understanding of the program. (A list of keyboard commands is available in **Appendix D: Menus and Keyboard Commands**.)

The tools at the left are the tools you'll be using throughout this Tutorial. They are located in the Tool Bar at the right of your screen.

You should also be familiar with the following areas and items on your screen:

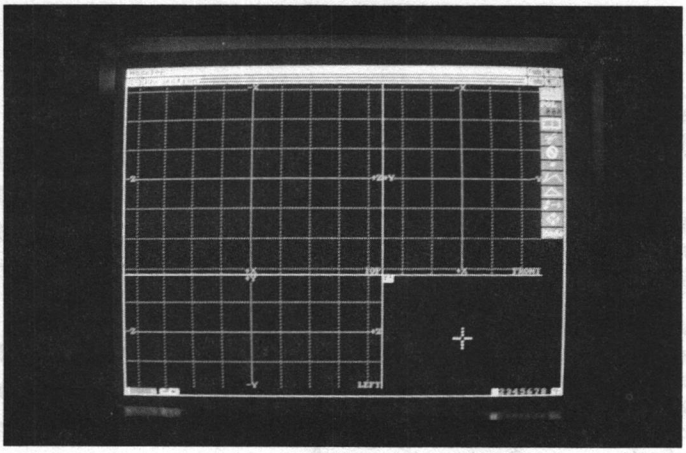


Figure 3.1: The Modeler 3D Projection window.

Layer gadget

12345678

Lock Plane gadget

Grid gadget

1 m

Part One - Making a Barn

The following tutorial will guide you in creating a Barn and Silo scene for use in VideoScape 3D. Before continuing, save any work you have already done.

1) Choose **New** from the **Project** menu.

A requestor will appear asking if you're sure you want to do this. This is because **New** will clear whatever is in memory.

2) Select **OK** to confirm.

First you're going to create an outline — a template — that you'll then "extrude" into a three-dimensional shape. The **Template** window provides the easiest way to do this.

3) Choose **New Window - Template** from the **Display** menu.

The display will change to show only the **TOP** view. Because you can only define two dimensions in this window, you only need to click once to enter a point.

4) Click on the Curve tool and click the Selection button anywhere in the view.

The first point of the curve will appear. The Curve tool will connect each successive point with a line to the point before it.

5) To see how the Curve tool works, click several more times.

6) Clear the screen by clicking twice on the Delete tool. The first click will erase the selected point and the second will have a global effect deleting everything else on the screen.

7) Click on the Grid gadget in the lower left corner of the screen to place the coordinates in the lower right corner of the screen.

8) Use the Curve tool to create an outline as shown in the following picture.

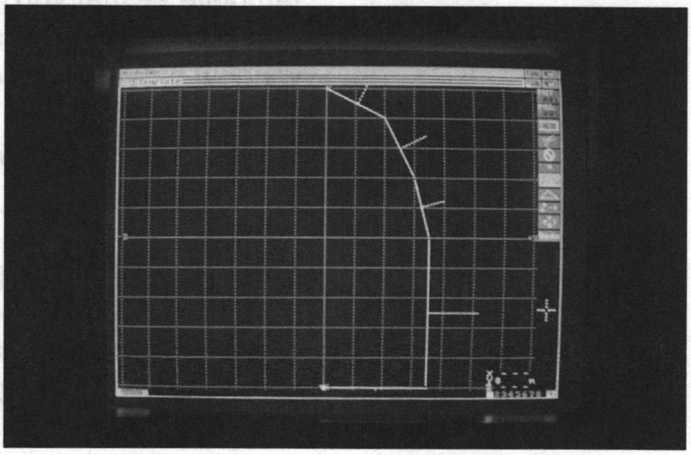


Fig. 3.2: Use the Curve tool to define the shape of the barn.

The point locations, in order of entry, are:

X = -5, Y = 0, Z = 0
X = -4, Y = 0, Z = 2
X = -2, Y = 0, Z = 3
X = 0, Y = 0, Z = 3.5
X = 5, Y = 0, Z = 3.5
X = 5, Y = 0, Z = 0

*Note: Since the **Template** window is a 2-D view of the **X** and **Z** axes, the **Y** coordinates will automatically be set at **0**.*

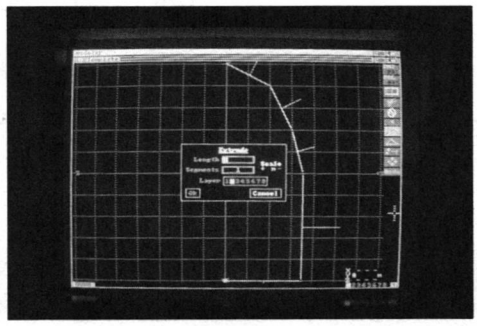
9) Click in a blank area of the window to deselect the last point on the curve.

10) Select Polygon Mode and then click again in a blank area to deselect the polygons.

The form will change from red to white showing the polygons are no longer selected.

11) Choose **Extrude** from the **Generate** menu.

The **Extrude** requester will appear with the **Length** edit field active.



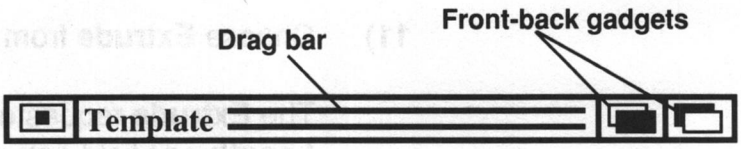
12) Press the DEL and/or BACKSPACE keys to erase anything that might be in the **Length** edit field. Type **10** and press the RETURN key.

The text cursor will advance to the next edit field. (Instead of pressing the RETURN key, you can also click in the next edit field.)

13) Delete anything in the **Segments** edit field and type **3**.

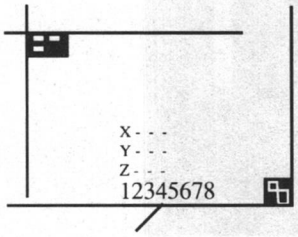
14) Make sure that layer **2** is selected and choose **OK**.

15) To see the results, select the left front-back gadget of the **Template** window.



Layer **1** of the **Projection** window will appear from behind the **Template** window. It's drag bar is ghosted to show that it is inactive.

16) Click on the **Projection** window drag bar to activate it, and select **2** from the Layer gadget.



17) To center the roof in all three views, choose **Auto Scale** from the **Display** menu (or press the Amiga-A keys on the keyboard).

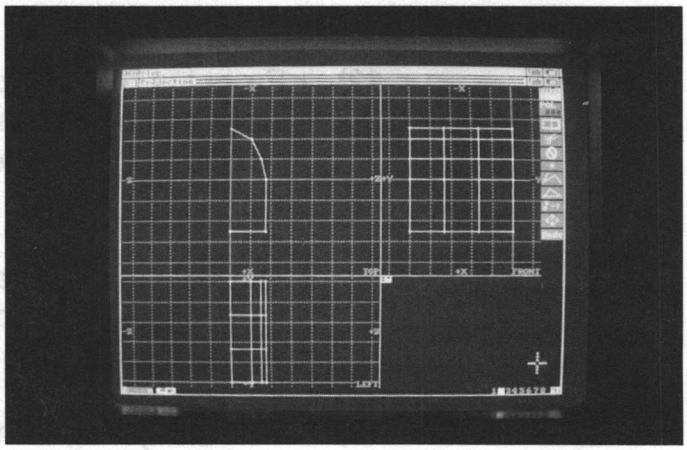


Fig. 3.4: Center the roof in all three windows.

18) Click again on the Grid gadget to bring the coordinates to this window.

19) Select the right half of the Volume mode icon to enter Inclusive Mode.

20) In the **FRONT** view, drag the Volume around the inner left points as shown below, and choose **Select Points** from the **Edit** menu.

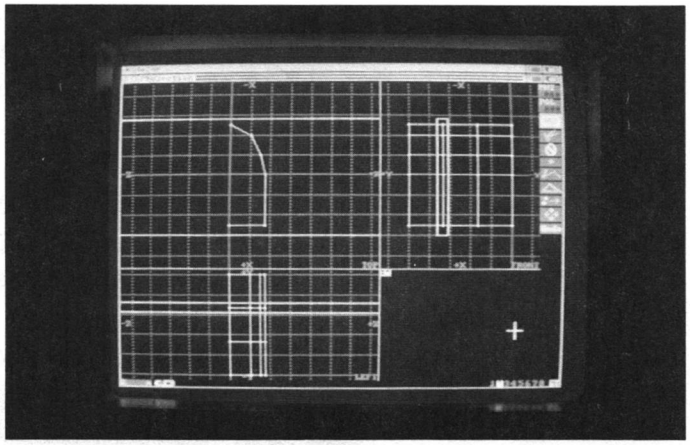


Fig. 3.5: Drag the Volume around the inner left points.

21) Click on the Move Points tool and place the cursor in the **FRONT** view.

A red line will attach the cursor to one point. In theory, the cursor is attached to the last point selected. However, because all the points were selected at once, Modeler 3D chose a point for you.

22) These points need to be shifted to the left in the **FRONT** view. Place the cursor at **X=5, Y=9**. The red line should be perfectly horizontal.

23) Press the Selection button to move the points to their new location.

24) Click in a blank space to get rid of the Volume, then make one (as in step **20**) around the inner right points and select those.

25) Again using the Move Points tool, place the cursor at **X=5, Y=1**, and press the Selection button.

26) Get rid of the Volume again by clicking in a blank space, then click on Point Mode and deselect all the points.

Your screen should look like this:

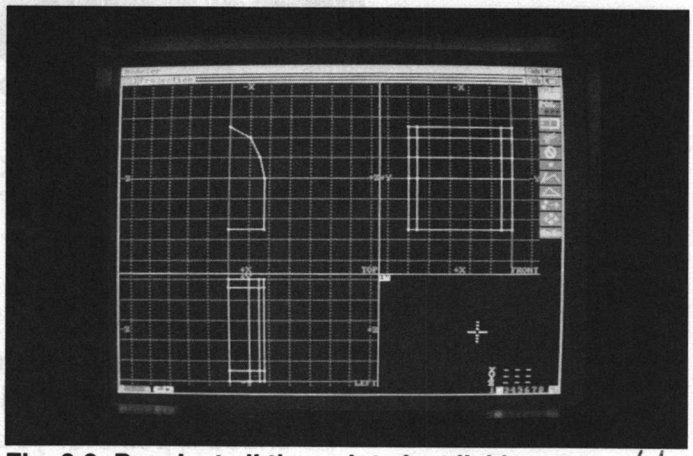


Fig. 3.6: Deselect all the points by clicking on Point Mode.

27) Now we'll make the roof overhang the barn a bit. Choose the Inclusive Volume Mode tool by clicking on the left side of the Volume tool. In the **FRONT** view, drag the box around the

lower-right-most point and click on the Delete tool.

28) Repeat step **27**, only this time drag the box around the lower left-most point.

29) Click in a blank space to get rid of the Volume.

30) Drag the Volume around the overhanging points on the right side of the **FRONT** view as shown below.

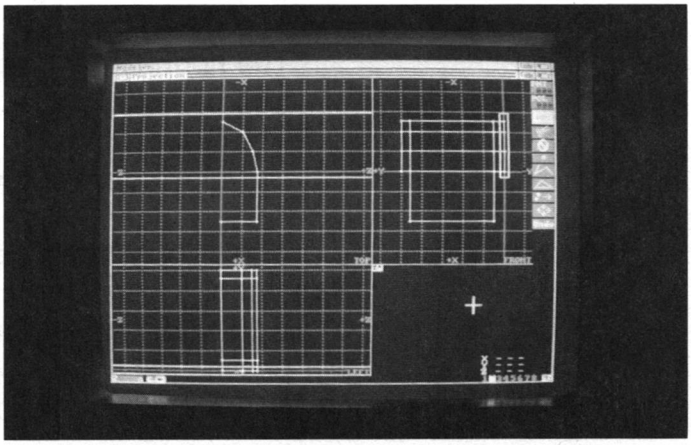


Fig. 3.7: Drag the Volume around the right side.

31) Choose **Copy** from the **Edit** menu. Make sure that layer **3** is selected and click on **OK**.

32) Repeat steps **28** through **30** for the overhanging points on the left side of the **FRONT** view. These should also be copied to layer **3**.

33) Go to layer **3**.

34) Click in a blank space and choose **Select Polygons** from the **Edit** menu.

Notice in the **TOP** view that the normals are only on one side of the polygons. This means the polygons are only visible from that side. Since these pieces are overhanging the barn, they must be made visible from the bottom as well.

35) Choose **Polygon - Flip** from the **Edit** menu (or press the Amiga-F keys).

The normals have now shifted to the other side of the polygons.

36) **Cut** these back to layer **2** and go there.

The display looks the same, but the overhang pieces will now be visible from both sides. However, in the process of pasting the other sides on we created some duplicate points which we need to get rid of.

37) Choose **Merge Points** from the **Modify** menu.

A gauge will appear showing the progress of the merge, and then a window will tell how many points were eliminated.

38) Now we need to create the front and back ends of the barn. Click on the Lock Plane gadget.

It will change to a skeleton key and a red line will appear attached to the cursor.

39) Place the line in the **FRONT** view as shown in the following picture and click the Selection button. This is where **Y=9**.

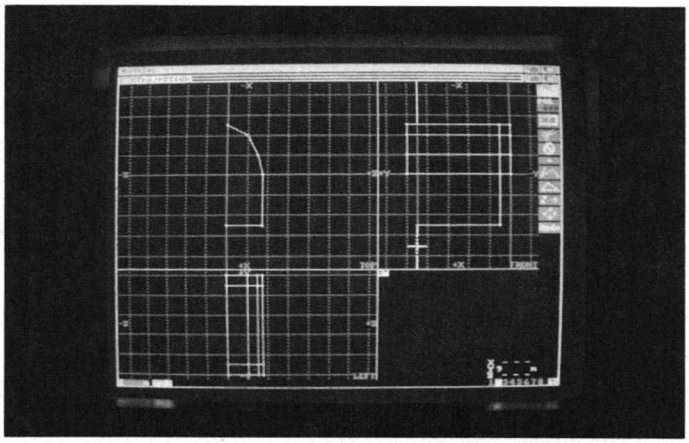


Fig. 3.8: The Lock Plane gadget will change to a closed lock.

The **Lock Plane** gadget will change to a closed lock. Now, when you click on points in the **TOP** view, Modeler 3D will know that you want the points on the back side of the barn, where Y=9, rather than the front side, where Y=1.

40) Go into Point Mode and in the **TOP** view, click on the points in a clockwise sequence.

You must select the points in order**.** If you skip one, deselect the points and start over.

41) Click on the Add Polygon icon and click in a blank area to deselect the points.

42) Click on the Lock Plane gadget twice. The first click will unlock the plane and the second will allow a new plane to be locked.

43) Lock the plane on the front wall by placing the red line on **Y=1** in the **FRONT** view and pressing the Selection button.

44) In the **TOP** view, select the points in a counter-clockwise direction. Selecting the points in order is important!

45) Click on the Add Polygon gadget.

Let's look at what we've got so far.

46) Choose **New Window - Color Preview** from the **Display** menu.

A **Preview** window will open up on another screen. Two gray stripes will be visible, but you won't see the barn yet. Place the cursor just below the drag bar in the center of the screen and click once. Click a few more times and you'll see the rest of the barn come into view.

Notice that only half of the barn is visible. We'll work on that in a moment. First, let's add some color to the barn.

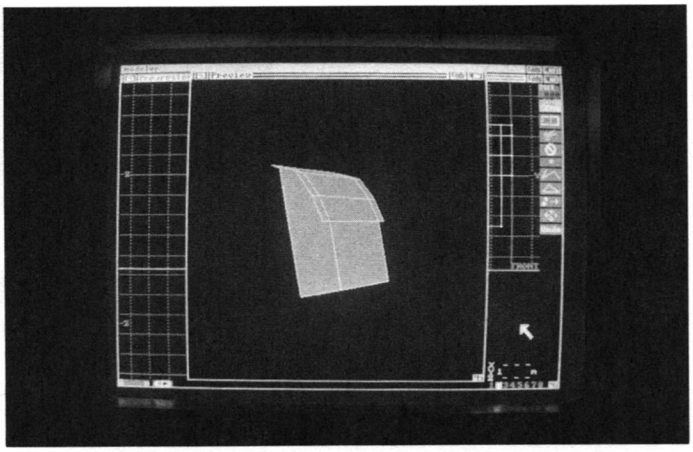


Fig. 3.9: The barn will come into view.

47) Close the **Preview** window by clicking on the close button on the left side of the drag bar.

48) Select the Polygon Mode icon and click in a blank space to deselect the polygons.

49) In the **TOP** view, select the polygon at the bottom of the wall by clicking on its center.

Three normals will appear in the **FRONT** view. If they don't, repeat steps **48** and **49**.

Note: For a complete list of corresponding colors and numbers, refer to ***Appendix F: The Color Chart.***

50) Choose **Polygon - Set Color** from the **Edit** menu.

51) Click on the three stars (***) below the word **Smoothing.** The **Color Selection** chart will appear at the bottom of the screen.

52) Click on color **4**, the dark red block, and choose **OK**.

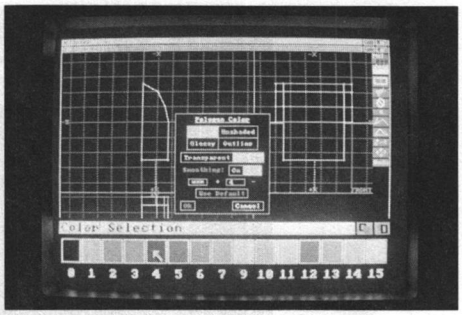


Fig. 3.10: The Polygon Color requester.

53) Deselect the polygons.

54) In the **TOP** view, select the polygon on the right by clicking on it.

Again, three normals appear. This time, however, we only want the one pointing right in the **LEFT** view.

55) In the **LEFT** view, place the cursor on the selected polygons facing up and down and click on each of them to deselect them.

You're screen should look like **Fig. 3.11.**

56) Choose **Polygon - Set Color** from the **Edit** menu again. Set the color to the same red (color **4**), and select **OK**.

57) Take another look at the barn now with **New Window - Color Preview** in the **Display** menu.

Moving around the barn, you'll notice that at times the red wall will show through the

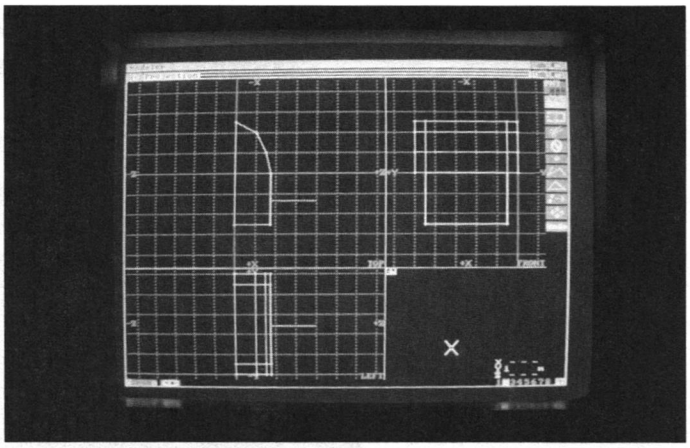


Fig. 3.11: The barn with walls selected.

overhanging roof. This happens because the center point of the wall is actually closer to you than the center of the piece of roof. The best way to change this is to divide the wall into two pieces. First, we need to add a point to each end wall.

58) Close the **Preview** window and deselect the polygon that is still selected.

59) Select **Set Point** from the **Edit** menu.

60) Click in the **Y** edit field in the **Point Coordinates** requester. Erase whatever is there, type **9**, and select **New** to create a new point.

You'll notice a point has been added halfway up the wall in the **TOP** view.

61) Switch to Polygon Mode and click on that point to select the polygon it will be attached

to. Go to the **FRONT** view and deselect the polygon on the right side.

You're screen should look like this:

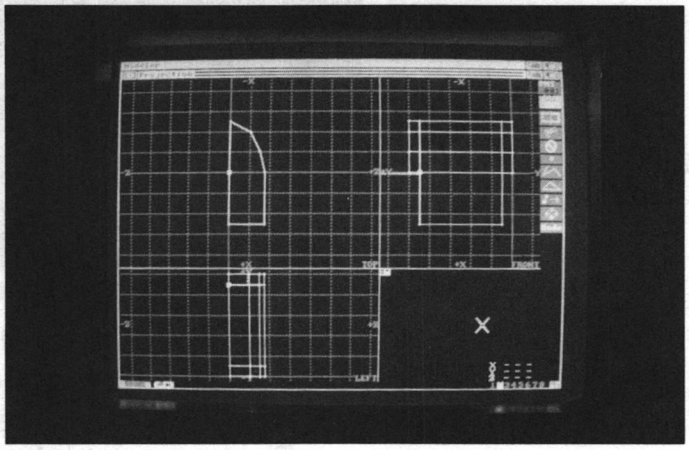


Fig. 3.12.

62) Now choose **Polygon - Insert Vertex** from the **Edit** menu. Click once more on the point to tell Modeler 3D that the shape of the polygon stays the same.

63) Deselect all points and polygons then click on the Lock Plane gadget to unlock it.

64) In **Point Mode**, select the points at **X=0, Y=9, Z=0** and **X=0, Y=9, Z=3.5**. Go to Polygon Mode and select the same polygon we were just dealing with, making sure it is the only one selected.

65) Choose **Polygon - Split** from the **Edit** menu.

A line now divides the wall into two pieces.

Do the same thing to the other side by repeating steps **58** through **66**, only this time lock the plane on **Y=1**, create the point at **X=0, Y=1, Z=0**, and use the point at **X=0, Y=1, Z=3.5** as the other point.

66) When you've finished dividing the back wall, take a look at the barn with **Color Preview**.

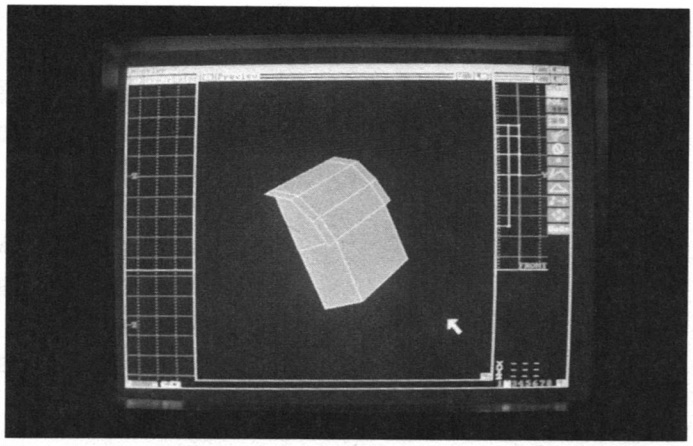


Fig. 3.13: The barn, so far.

Viewing the barn at certain angles will still cause the wall to be visible through the roof. You could fix this by dividing the wall into more pieces as we've just done, but for now we'll leave it as it is and continue to make the other half of the barn.

67) Close the **Preview** window and deselect all the points and polygons.

68) Choose **Mirror** from the **Modify** menu.

69) In the **TOP** view, place the mirror axis on the left edge of the barn (**Z=0**) and click the

Selection button. Choose **OK** in the requester to put the result on layer **2**.

The barn half will be mirrored to make a complete barn. Again, there are duplicate points as a result of the mirror, so let's get rid of them.

70) Select **Modify - Merge Points** and then **OK**.

71) Select **Save As - Binary** from the **Project** menu. In the **File** edit field, type **Barn.geo** and click **OK.**

Your barn is now saved in the Modeler 3D **GEO** directory as **Barn.geo**. The **.geo** extender means the barn is a geometry (or object) file, as opposed to a camera or object motion file.

72) Choose **Display - New Window - Color Preview** to see the finished barn.

This is a good point to take a break if you wish. Part Two of this tutorial will create a silo to complete the barn. Then, in Part Three, we'll make a camera motion file for VideoScape 3D.

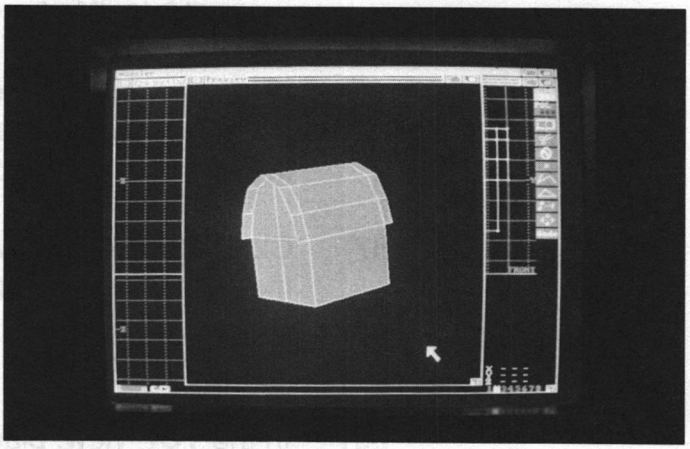


Fig. 3.14: The finished barn.

Part Two - Making a Silo

1) Choose **New** from the **Project** menu and select **OK**.

2) Select **Open - Object** and load the **Barn.geo** file from the **GEO**directory into layer **1**. Press Amiga-A to center the barn in the three views.

3) Open the **Template** window, select layer **2**, and click on the Grid gadget to bring up the coordinates.

4) Using the Curve tool, draw the image shown below from top to bottom:

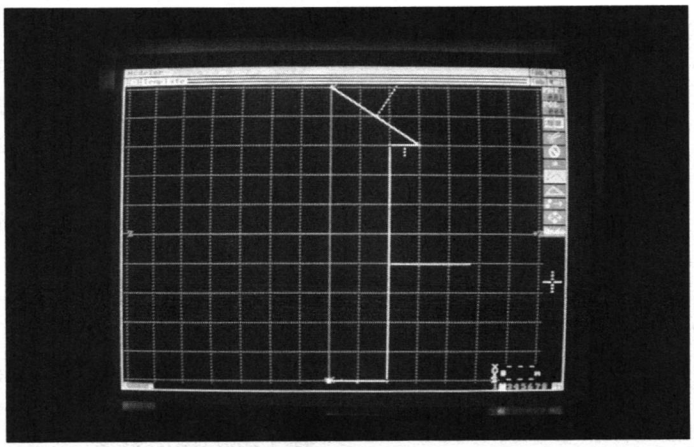


Fig. 3.15: Using curve to draw the silo.

5) Deselect all the points and polygons.

6) Choose **Lathe** from the **Generate** menu.

The Lathe requester will appear.

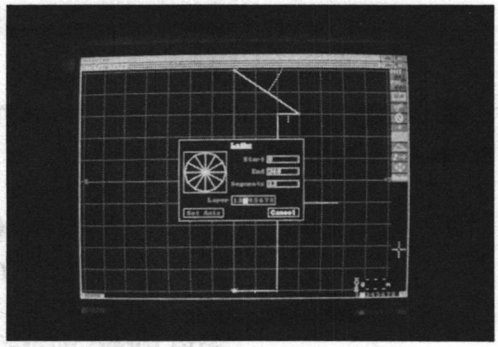


Fig. 3.16: The Lathe requester.

7) Click in the **Segment** edit field, enter **24** and press RETURN.

The red "wheel" represents the number of the segments you've selected. Since you changed the default **12** to **24**, the number of "spokes" has doubled. Imagine this wheel to be a view of your object from above. Every spoke will be a copy of your lathe template when you execute the function.

8) Make sure the layer is set to **3**.

9) Click on the **Set Axis** button.

A red line will appear attached to your cursor. This line represents the axis Modeler 3D will spin the object around. In this case, put it down on **Z=0**, making sure the line is vertical.

10) Go to layer **3** in the **Projection** window and press Amiga-A to **Auto Scale**.

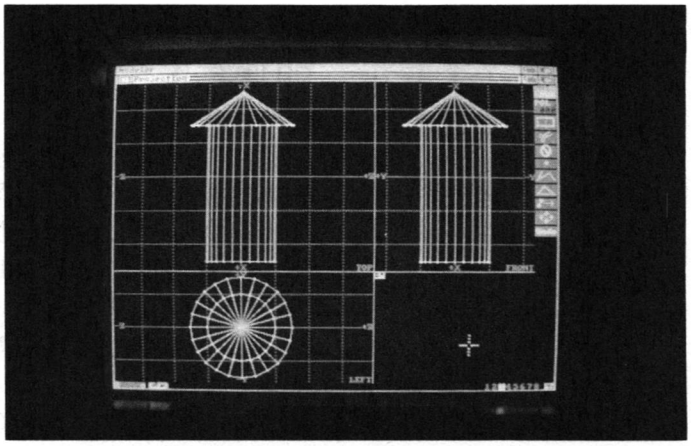


Fig. 3.17: The 3-D silo.

The outline you made has been spun full circle so the object is a 3-D silo. Now we need to position it near the barn.

11) Go to layer **1** and - while holding down the ALT key - click on layer **3**.

The silo will appear in white and the barn will appear in blue. Any commands chosen in this state will affect only the silo, since the barn is being used in a background layer. Notice that the **3** on the Layer gadget is also in white to show it is a foreground layer.

12) Press Amiga-J to select all the points of the silo. Next, select the Move Points tool and place the cursor in the **TOP** view at **X=5** and **Z=10**. The **Y** coordinate is not shown. Click the Selection button to move the silo.

13) Deselect the points and return to layer **1**. This will cancel the background layer.

14) This time, holding the SHIFT key down, click on layer **3**.

Both the barn and silo are shown in white (you may need to press Amiga-A to **Auto Scale**). This means that both are foreground layers and any editing will affect both of them. Since they are still in separate layers, we'll copy them into one.

15) Choose **Copy** to layer **4** and then move to layer **4**.

Now layer **4** contains both the barn and silo. The last step is to rotate the barn and silo so the **TOP** view is really the top view of the objects together.

16) Choose **Rotate** from the **Modify** menu.

The **Rotate** requester will appear with three boxes in it representing the three views (**TOP**, **FRONT** and **LEFT**). Modeler 3D will rotate in the view box you click in.

17) Rotate the scene 90 degrees counter-clockwise in the **FRONT** view by clicking on the box beside the red one.

These boxes represent the three views, so Modeler 3D knows to rotate the **FRONT** view now.

18) Click the **+90** button.

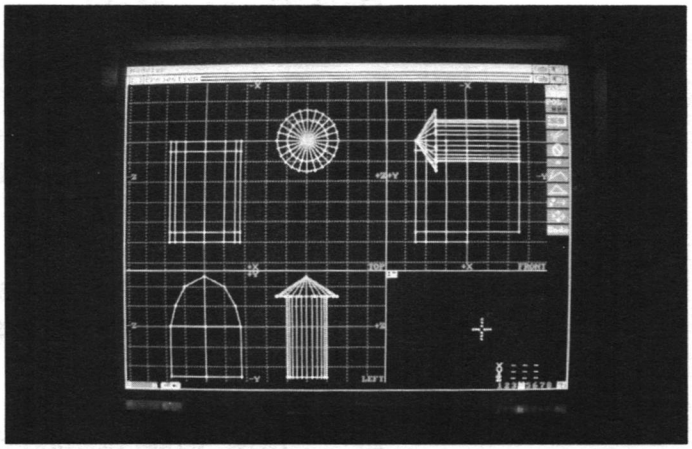


Fig. 3.18: The finished scene.

The line in the angle box will turn 90 degrees.

19) Select **OK**.

20) Choose **Save As - Binary** and save this layer as **BarnScene.geo** in the **GEO** directory.

Part Three - Making a Camera Motion File

Now we'll make a camera motion file to view the barn and silo in VideoScape 3D. To do this, go to a **Template** window for layer **4.**

1) Turn the coordinates back on and hold down an Amiga key while pressing the < key four times to zoom out.

2) Now, while holding down the ALT key, click on layer **5**.

The barn and silo will turn blue showing that they are in a background layer.

3) Select the Curve tool and draw a circle around the barn and silo similar to the one shown below:

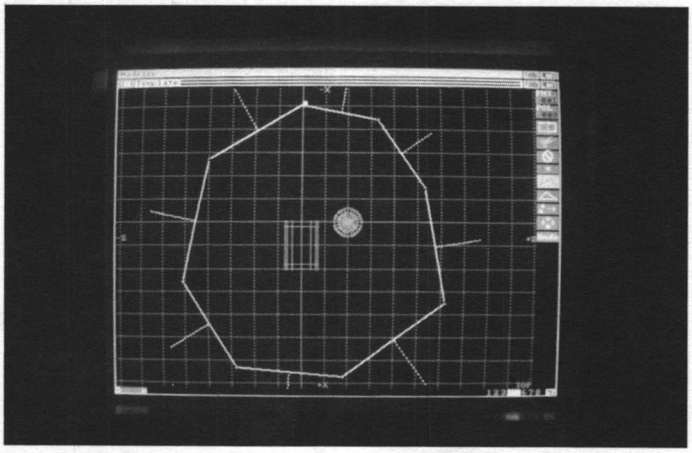


Fig. 3.19: Draw a circle around the barn and silo.

4) With the polygons still selected, choose **Edit - Polygon - Set Color**. In the edit box containing the color code (it should read **15**), change the number to **4**. Click **OK**.

This tells Modeler 3D that there are **4** frames between each point. The number of frames may be different for each polygon, and is set by entering the number as a color.

The last point you entered should still be selected. Modeler 3D will use this point to determine where the first frame of the motion is, so leave it selected.

5) Choose **Project - Save As - Motion**.

A requester will appear allowing you to set the type of motion file (for more information on **Motion File** options, refer to **Chapter 8: Special Commands**). Since we are going to use the **Track Object** option in VideoScape 3D, just click **Create Motion**. Name the motion **BarnView.cam** in the **CAM** directory.

Loading Your Work Into VideoScape 3D

1) Load VideoScape 3D. If you have one megabyte (or more) of memory in your machine, you can run both Modeler 3D and VideoScape 3D at the same time.

2) Click on the **Load Object** button and load

the **BarnScene.geo**. Click **OK** twice.

3) Click the **Load Motion** button and switch to the **CAM** directory when the requester appears. Load the **BarnView.cam** file, and tell VideoScape 3D to **Track Object 1**.

9) Click **OK.**

10) Click on **Begin Animation.**

11) If you wish to record the animation, refer to your VideoScape 3D manual for directions on making ANIM recordings, and on the rest of this program's operation.

(For more information on motion in VideoScape 3D, see **Appendix C: Motion in VideoScape 3D**.)

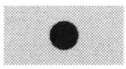
CHAPTER

4 Object Creation Tools

In this chapter:
- **Add Point**
- **Curve**
- **Add Polygon**
- **Sphere**
- **Plane**
- **Box**
- **Tube**
- **Inside Faces**

Modeler 3D provides many tools for creating objects. Since all objects are made up of points and polygons, there are tools for use in each of these modes.

Add Point



The Add Point tool is used to enter points in the **Projection** and **Template** windows. Points exist only to mark location — they have no shape of their own. In Modeler 3D points are used to define:

- **Dots**. These are called "one-point polygons," such as a star field in outer space.
- **Lines**. These are called "two-point polygons."
- **Polygons** (flat shapes of three or more straight

lines). These are called "surface polygons."

Since a point is nothing if it doesn't describe a polygon, you won't see a pictorial rendering of just a point in either a **Preview** window or VideoScape 3D's Animation Window.

To enter a point:

- Select the Add Point tool.
- The icon will highlight to show it is the current mode.

  Position the cursor in any view and click the Selection button.

  A point will appear if you're in the **Template** window (or if you're in the **Projection** window and you've locked a plane beforehand. See **Lock Plane** in **Chapter 7: Special Commands**). Otherwise, you've only entered two coordinates at which to place the point and you won't see it until you've entered a third.
- Position the cursor in another view and click the Selection button.

  A point will appear (in all three views if you're in the **Projection** window). It will remain selected (highlighted) as you enter other points.
- Repeat the previous steps to enter more points.

Holding the SHIFT key when selecting the Add Point icon allows one point to be created and then returns to the previous editing mode.

Curve

The Curve tool is used to describe a series of connected lines: two-point polygons that share points. This is useful for drawing outlines to be lathed or extruded into 3-D objects. Curves are also used to define motion paths for objects to follow when animated in VideoScape 3D.

To create a curve:

- Select the Curve tool.

  The icon will highlight to show you are in Curve mode.

- Position the cursor in any view and click the Selection button.

  A point will appear if you're in the **Template** window (or if you're in the **Projection** window and you've locked a plane beforehand. See **Lock Plane** in **Chapter 7: Special Commands**). Otherwise, since you've only entered two coordinates at which to place the first point of the curve, you won't see it until you've entered a third.

- Position the cursor in another view and click the Selection button.

  The beginning point of the curve will appear (in all three views if you're in the **Projection** window). As soon as you enter another point, you'll see the first segment of the curve. Remember, it takes two points to define a line.

- Repeat the previous steps to enter more points.

  A curve will appear, segment by segment. The last point you entered will be the only one selected. This ensures that the next point entered will be attached only to it.

Add Polygon

In traditional terms, a polygon is a flat shape described by three or more straight lines. In Modeler 3D terms, we call this a "surface polygon" to distinguish it from dots and lines, which are also "polygons." All three types of polygons are created with the Add Polygon tool.

A surface polygon in Modeler 3D can be any shape (triangle, circle, alphabet character, etc.) However, the points that make up the polygon (its vertices) should be "coplanar." That is, the surface of the polygon should be completely flat in order for it to be rendered properly in VideoScape 3D.

Imagine a flat sheet of paper as a surface polygon and the corners as its vertices. These points all lie in one plane (they're coplanar). If we fold the paper diagonally, the polygon is still made up of the same points and lines, yet the surface is no longer flat, making the points "nonplanar." A nonplanar polygon does not contain enough information for VideoScape 3D to render it properly, no matter how smart the software is. Therefore, the solution is to break it down into two triangles, which are always coplanar. They can then each be shaded correctly.

When a surface polygon is described in the **Projection** window, a dashed line is placed in the center at a right angle to the surface of the polygon. This shows which way the surface faces. You can also say that the line is placed "normal to the surface," which is why we call this line the "normal."

The first "vertex" is the first point entered or selected when the polygon is defined. It is important because the plane (a triangle) formed by the first vertex and the two vertices adjacent to it determine the direction of the normal. Modeler 3D and VideoScape 3D always follows this convention for determining the plane of the whole polygon, bent or not. One thing to remember, if the first vertex lies in a line with the two vertices adjacent to it, a plane will no longer be defined and Modeler 3D will not be able to compute a normal for it.

Modeler 3D defines only one side of a polygon. As a result, you can only view it from one side in Modeler's **Preview** windows. This technique is called "back face removal." It reduces the amount of calculations Modeler 3D must do, and thus the

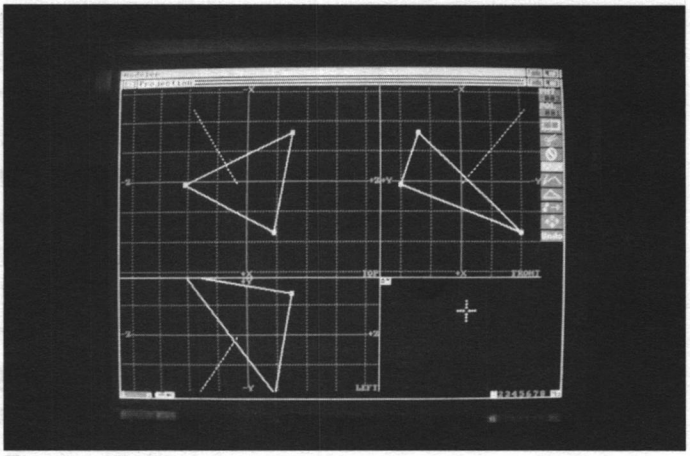


Fig. 4.1: Vertices and normal.

amount of time required to draw the object. For example, whenever you resize the views, Modeler 3D must redraw the object. An object made of ten thousand single-sided polygons can take some time to redraw. It would take much longer if they also had backsides and you may run out of memory. Such an object file would also take up a lot of space on disk.

The idea, then, is to make sure that all of an object's polygons face outward. A polygon is made visible by entering or selecting points in order, in a clockwise direction in that view. For example, if you wanted the top side of a box visible, you would enter the corners in the **TOP** view in a clockwise direction. If you wanted the top visible only from inside the box, you would enter the corners in a counterclockwise direction.

To define a polygon:

- Either enter points with the Add Point tool, or select points with the Point Mode tool in sequence — a clockwise direction makes the visible side face you in that view.

  Polygons can share points, therefore it doesn't matter if the points you have selected are already being used.

- While the points are still selected, choose the Add Polygon tool.

  A polygon will appear on the selected points.

  If only one point was selected, you won't notice a difference, but the polygon count will increase by one. If two points were selected, they will be joined by a line and you'll see a normal in the **Template** window. If three or more points were selected, they'll be joined by lines and you'll see a normal in the **Projection** window. The polygon will be highlighted to show it is selected.

Although double-sided polygons don't exist, we can simulate them by creating two polygons with opposing faces.

To define polygons with opposing faces:

- Enter or select points as described before, but hold down the SHIFT key as you select the Add Polygon tool.

Two polygons facing away from each other will be added on the selected points.

If two points were selected, you'll see two normals in the **Template** window. If three or more points were selected, you'll see the normals in the **Projection** window.

Graphic Primitives

The last section of the **Generate** menu contains commands for making 3-D primitives of varied sizes, proportions and number of points. You can then assemble these using the **Modify** menu commands to create a complex object.

To create a simple object:

- Choose an object from the **Generate** menu.

  A requester will appear which lets you control the object's characteristics. These differ for each object type and are described in the following sections.

- If you'd like to change the **scale**, select either the plus (+) or minus (-) sign until you get the desired units.

- Click in the desired edit fields and press the BACKSPACE and/or DEL keys to erase what's there so you can type new values.

- Select the desired layer and select **Ok**. Or select **Cancel** if you change your mind.

- Move to that layer by clicking on its number in the Layer gadget.

  You'll see the new object in that layer (you may have to select **Auto Scale** from the **Display** menu to see the entire object).

Sphere

This creates a ball composed of rectangles. These entries will produce the following object:

Radius	**1 m**
Rings	**5**
Points per Ring	**12**

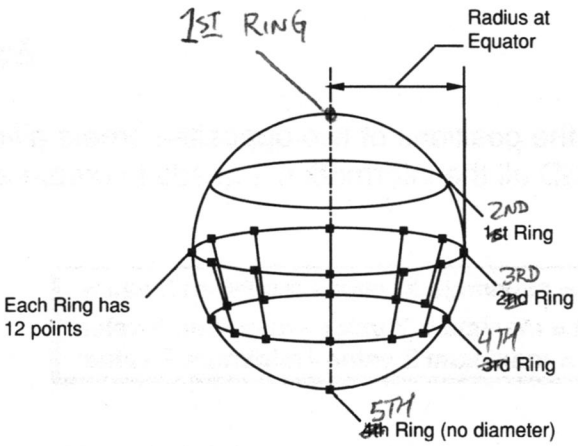
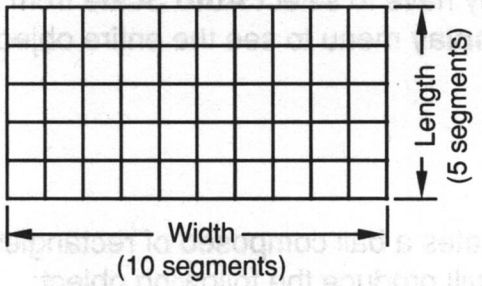


Fig. 4.2: A Sphere.

Plane

This creates a flat surface composed of rectangles which will appear standing on end in the X-Z plane. You can slant it or lay it flat by selecting **Rotate** from the **Modify** menu.

These entries will produce the following object:



Length	**10 m**
Segments	**10**
Width	**5 m**
Segments	**5**

Fig. 4.3: A Plane.

Box

Entering the positions of two opposite corners gives Modeler 3D all the information it needs to create a box.

Width = maximum X value - minimum X value
Height = maximum Y value - minimum Y value
Depth = maximum Z value - minimum Z value

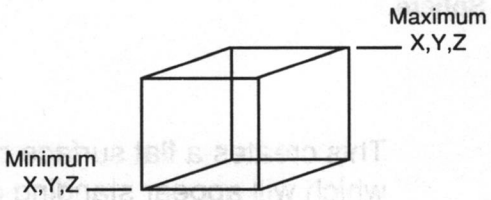
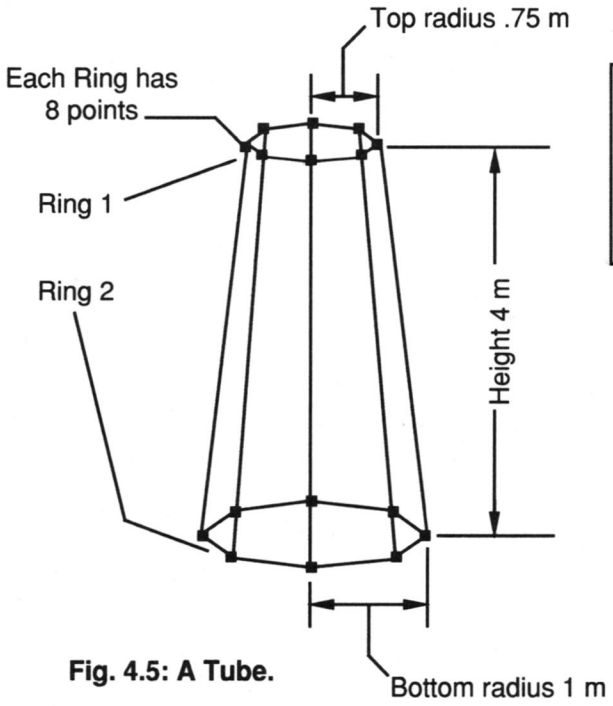


Fig. 4.4: A Box.

Tube

This creates a hollow cylinder when you make the top and bottom radiuses equal; if they're unequal, the object will be more like a cone.

These entries will produce the following object:



Top Radius	**.75 m**
Height	**4 m**
Bottom Radius	**1 m**
Rings	**2**
Points per Ring	**8**

Fig. 4.5: A Tube.

Inside Faces

Selecting this option causes the objects mentioned above to be generated with polygons facing inside as well as outside. For example, if a box were created with **Inside Faces** selected, the box would be visible from the inside and outside. If the same box were created without **Inside Faces**, only the outside would be visible.

CHAPTER

5 Universal Commands

In this chapter:

- **Delete**
- **Cut**
- **Copy**
- **Mirror**
- **Array**
- **Change Color**
- **Rotate**
- **Translate**
- **Scale**
- **Remap**
- **Merge Points**
- **Quantize**
- **Translate To Center**
- **Merge Distance**
- **Set Center**

The following commands operate on active items as determined by the edit mode. It is important that you understand the selection methods before you work with these editing functions or you may get unexpected results. Please refer to **Selection Modes** in **Chapter 2: The Modeler 3D Universe**, for an explanation of selection methods.

Delete

The Delete function removes active items from the foreground layer(s) and discards them. You delete items by choosing **Delete** from the **Edit** menu, selecting its corresponding icon, or by pressing Amiga-Z or DEL on your keyboard.

Cut

The **Cut** function removes active items from the foreground layer(s) and places them at the same coordinates in another layer. **Cut** items by choosing the command from the **Edit** menu, selecting the **Cut** icon, or by pressing Amiga-X on your keyboard.

Cutting out parts of a large object to work on separately can save time. For example, if you are working on a very large object such as a city, the time required to update the screen after each modification will increase as the object becomes more complex. However, you can **Cut** a part of the object into another layer, work on just that small part, then merge it back into the main object when you are done. By keeping the thing you're working on small, you can optimize Modeler's performance.

The **Cut** function also helps to maintain order in the three **Projection** views. For example, if you load a car object, the view which shows the back of the car also shows the front superimposed. If you want to edit the back, you have to mentally separate the lines and points that make up the back of the car from those that make up the front. If you enclose the back of the car in a Volume and cut it into another layer. However, you'll see just the part of the car you want. If it's still too cluttered, you can keep cutting until you have something small enough to work on. When you're done you can put the car

back together by cutting all the parts out of their own layers and back into the main one. Selecting **Merge Points** from the **Modify** menu will get rid of any duplicate points, and your car's ready to roll!

*Note: When the section to be cut shares points with the rest of the object, those points are duplicated so that one set remains in the main layer while the other set is cut to the new layer. As a result, when the object is pieced back together there will be redundant points, which are often undesirable because they slow down operations. To eliminate them, choose **Merge Points** from the **Modify** menu. This will not work, however, if you have moved any of the "boundary" points, meaning those that would be merged with the points already in the object. The **Merge Points** function is fully described later in this chapter.*

Copy

The **Copy** function makes copies of the active items in the foreground layer(s) and places them at the same coordinates in another layer. **Copy** active items by choosing **Copy** from the **Edit** menu or by pressing Amiga-C on your keyboard.

Since the original is still intact, the **Cut** command should be used if you wish to edit the piece and reattach it.

Mirror

The **Mirror** function makes reverse copies of the active items in the foreground layer(s). The items can be mirrored in any of three directions: top-bottom, left-right, or front-back. This is convenient when making complex objects such as a vehicle. You can create half of the vehicle and then mirror it to instantly make the other half.

To mirror active items:

- Select the points or polygons to mirror.
- Choose **Mirror** from the **Modify** menu.

A line will appear, attached to a cursor. This is the axis on which the items will be flipped. For example, to mirror the right half of a car, you would place the axis down the middle. The axis can be vertical or horizontal in any of the views. Placing the cursor near the sides of a view will cause the axis to be horizontal, while placing it near the top or bottom will make the axis vertical.

- Place the cursor in any view and adjust it until the axis is in the desired orientation, then click the Selection button. Clicking in a blank area of the screen will abort the mirror.

  A requester will appear for you to choose a layer in which to put the mirrored duplicate. It defaults to the foreground layer because the mirrored and original objects are usually kept together.

- Select another layer if you'd like and select **OK**.

  The mirrored duplicate will appear. Remember that when an object is mirrored, duplicate points are created. Choose Merge Points to eliminate them.

Array

The **Array** function creates multiple copies of the active items arranged in a row. It leaves the

original and adds as many copies as you determine. The following picture shows an array of three barns, created from the barn in the lower left corner of the **Template** window using these values:

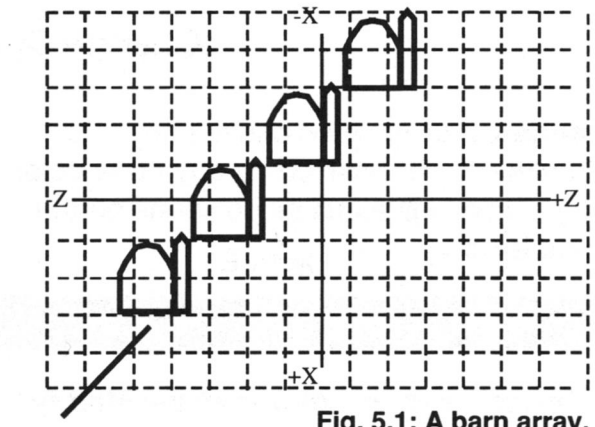


Fig. 5.1: A barn array.

Number:	**3**
X:	**-2 m**
Y:	**0**
Z:	**2 m**

To create an array of active items:

- Choose **Array** from the **Modify** menu.

  A requester will appear. Enter the number of copies, spacing and direction.

- If you'd like to change the scale, select either the plus or minus sign until you reach the desired units.

- Click in the desired edit fields and press the BACKSPACE and/or DEL keys to erase what's there and type new values.

- Choose another layer if you'd like, and select **OK**.

The duplicate objects will appear (you may have to select **AutoScale** to see the entire array).

Change Color

The **Change Color** function causes any one specified color to be replaced by any other color. Changing a color will affect all polygons on the foreground layer(s).

To change the color of active polygons:

- Choose **Change Color** from the **Modify** menu.

  A requester will appear asking for the colors you wish to change **From** and **To**.

- Click on the settings you wish to alter.

  If you forget the color codes, click on the (***) beneath the word **Smoothing** to see the color bar, or refer to **Appendix F: The Color Chart**.

  If you want all the colors in an object or group of polygons to change to your new color, choose the **Any Color** button.

- Select **OK.**

  A requester will appear telling how many polygons were changed.

Note: Modeler 3D will only display numbers 0 through 15 in the edit field. Entering larger numbers will change the attributes and leave the actual color number in the field.

Rotate

The **Rotate** function spins the set of active points around the center of the foreground layer(s).

To rotate active points:

- Choose **Rotate** from the **Modify** menu.

  A rotation requester will appear.

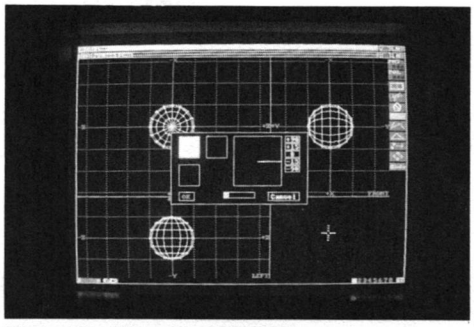


Fig. 5.2: The Rotate requester.

- The 3 boxes on the left side of the rotation requester represent the **Projection** window views. Click in the box corresponding to the view you wish to rotate in.

- The angle of rotation can be set in any of three ways:

  1) Click in the large box (called a "dial gadget") and drag the line to match the angle you wish to rotate to.

  2) Click on the buttons on the right side of

the requester to rotate in 15 and 90 degree increments, or reset it to **0**.

3) Click in the edit field and type in the angle you wish.

- Select **OK.**

The active points will be rotated to your specifications (you may need to choose **Auto Scale** to see the entire result).

Translate

Translate is used to reposition active points in the foreground layer(s). The X, Y, and Z offsets may each be changed separately.

To translate (move) active points:

- Choose **Translate** from the **Modify** menu.

The **Translate** requester will appear for you to enter the amount of movement for each axis.

- To change the scale, select either the plus or minus sign until you reach the desired units.
- Click in the edit fields, press the BACKSPACE and/or DEL keys to erase what's there, and type new values. Clicking the **Clear** button sets the offsets to **0** for "no change."

- Select **OK**.

  The active points have been moved the specified distances (you may need to choose **Auto Scale** to see all objects on the screen).

Scale

The **Scale** function is used to change the scale factor of active points. The standard scale is **1**. Therefore, a scale of **.5** will shrink the objects to half size. A scale of **2** would cause it to be twice it's original size.

Selecting the **Together** option will scale all directions equally, while the **Separate** option allows each dimension to be changed individually. The **Clear** button will return the settings to **1** (no change).

To scale active points:

- Choose **Scale** from the **Modify** menu.

  A requester will appear for you to enter the scale factors.

- Select **Together** or **Separate.**

- Type the scale factors in the edit fields and choose **OK**.

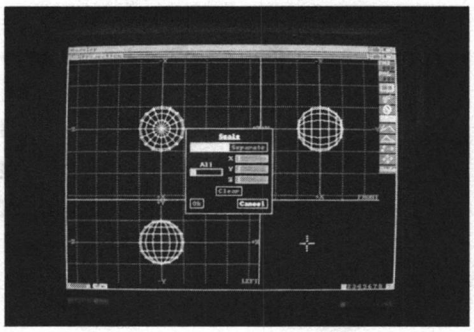


Fig. 5.3: The Scale requester.

The active items will be scaled to the size you specified (you may need to choose **AutoScale** to see the result).

Remap

The **Remap** function distorts active items in the foreground layer(s). This is useful for twisting, shearing, and many other things. Any operation you implement will take effect from the negative side of the chosen axis, to the positive side. Due to the many possible ways to use this function, we've provided a few "before & after" pictures. Examine these and experiment with your own variations.

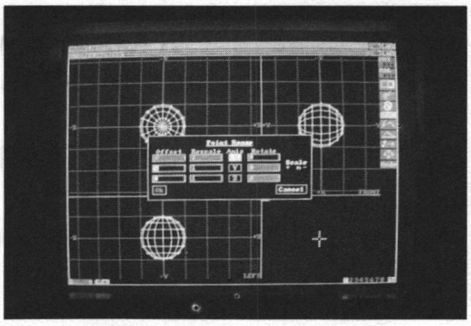


Fig. 5.4: The Remap requester.

Some examples of the Remap effect:

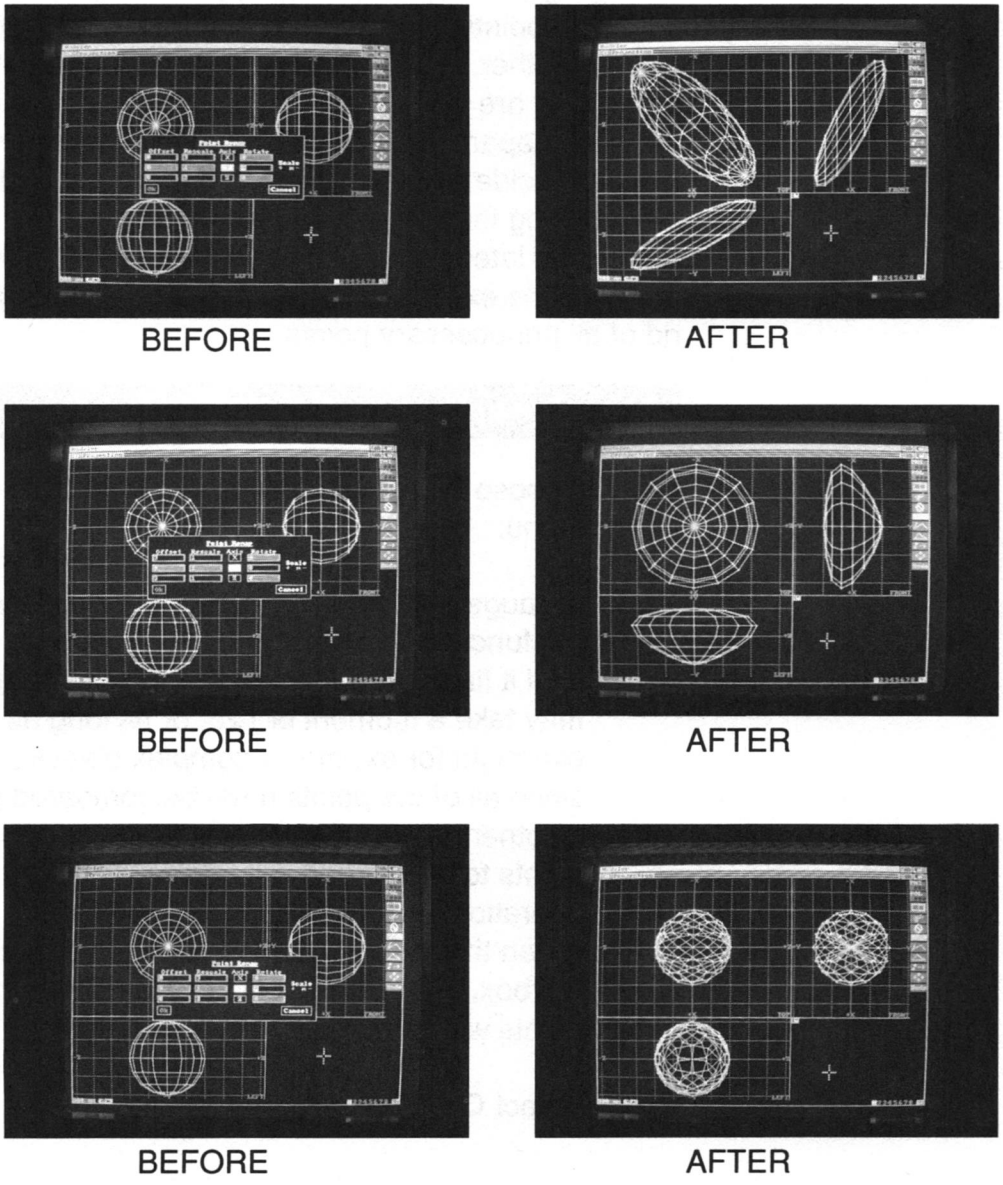


Fig. 5.5: Remap effects.

Merge Points

The **Merge Points** command is used to eliminate duplicate points by combining points that are very close together. The default setting will merge any points that are less than 1/1000 of the total size of the object apart. The size distance that Modeler 3D uses to decide whether or not to merge points can be set using the **Merge Distance** function (explained later in this chapter). Since every extra point means extra memory, it is a good idea to get rid of all unnecessary points.

To merge active points:

- Choose **Merge Points** from the **Modify** menu.

  A gauge will appear showing the progress of the function. The bar will move smoothly until it finds points to merge. This process may take a moment or two, or as long as overnight for extremely complex objects, since all of the points must be compared with all other points. Setting a volume around the points to be merged will narrow down the operation and speed it up considerably. When the red bar reaches the right side of the box, Modeler 3D will tell you how many points were merged.

- Select **OK**.

Quantize

The **Quantize** command snaps the active points to the current grid. This means every point will be moved to the grid intersection closest to it. It is likely that you'll need to **Merge Points** after using **Quantize.**

The grid snap may be set with the **Grid** function explained in **Chapter 9: Display Commands**.

To snap selected items to the current grid:

- Choose **Quantize** from the **Modify** menu.

  All active points will be moved to their nearest grid intersection.

Translate To Center

The **Translate To Center** command allows an active point or set of points to be moved to the center of the foreground layer(s) (**X=0, Y=0, Z=0**).

To center an active point (or points):

- Select the point you wish to move to the center. If you are selecting more than one, make sure that the point you wish to be exactly on the center is selected last. Do this by clicking on it in two views to deselect it, then click on it again to reselect it. Selecting more than one point may distort the object.

Note: The last point selected will be moved to the center position.

- If you wish to move the whole object with the selected point(s), enter Polygon Mode. If you only want the selected points to move, enter Point Mode.
- Choose **Edit - Point - Translate To Center**.

  The active points will be moved so that the selected point is centered.

Merge Distance

The Merge Distance function allows you to set the criteria Modeler 3D uses to determine whether or not to Merge Points. This may be either a Fixed distance, or a Fraction of the object. At the default setting, Modeler 3D is set to Fractional and will merge any points that are closer than 1/1000 (0.00100) of the maximum size of the object apart or less.

To change the merging criteria:

- Choose **Modify - Merge Distance**.

  The Merge Distance requester will appear.
- Choose the method of decision, Fractional or Fixed.

  If you choose Fixed, enter the maximum distance allowed between points by typing in the Fixed edit field.

- Change the **Scale** by clicking on the **+** or **-** buttons until you reach the desired measurement units. For example, if you typed **2** in the Fixed edit field and selected **M**eters as your measurement units, any points that are closer together than 2 meters will be merged when Merge Points is selected.

  If you chose Fractional, enter a value in the Fractional edit field. This amount will be compared against the total size of the object to determine the minimum distance between points.

- Select **OK** to save the settings or **Cancel** to abort.

- Now when you choose Merge Points, your settings will be used.

Set Center

Set Center allows you to specify the coordinates of the center of the foreground layer(s).

To set the center of the foreground layer:

- Choose **Modify - Set Center**.

  The values in the requester are the coordinates of the center of the **Projection** window, which is the center of the obejct if you've just **AutoScaled.**

- Enter the new coordinates in the **X**, **Y**, and **Z** edit fields.
- Select **OK**.

The center of the active layer will now be set to your specified coordinates.

CHAPTER

6 Direct Commands

In this chapter:

- **Select Points**
- **Select Polygons**
- **Set Point**
- **Point Info**
- **Polygon Info**
- **Set Color**
- **Flip**
- **Merge**
- **Split**
- **Select Vertices**
- **Remove Vertex**
- **Insert Vertex**
- **Default Color**

The following commands are all located in the **Edit** menu. They are mode independent, meaning they work in any mode, depending only on what points or polygons are selected (highlighted) on the screen. They are only enabled when items of the appropriate type are selected.

Select Points

Choosing this command or pressing the Amiga-J keys on your keyboard, causes all the points in a Volume to become active. If no Volume has been defined, all points in the foreground layer(s) are activated.

To select points:

If you would like all the points in your foreground layer(s) selected, do not define a

Volume, go directly to **Edit - Select - Points.**

- Click on either side of the Volume tool.
- Drag a Volume around the points you wish to select.
- Choose **Edit - Select - Points.**

The points will become highlighted to show that they are selected.

Select Polygons

This command is for selecting **Polygons,** and works similarly to **Select - Points.**

To select polygons:

If you would like all the polygons in your foreground layer(s) selected, do not define a Volume, go directly to **Edit - Select - Polygons**

- Click on either side of the Volume tool to choose Inclusive or Exclusive mode (see **Chapter 2: The Modeler 3D Universe** for more information on Inclusive and Exclusive).
- Drag a Volume around the polygons you wish to select.
- Choose **Edit - Select - Polygons.**

Note: Holding the SHIFT key down while you click lets you select additional polygons.

The polygons will become highlighted to show that they are selected.

Set Point

The **Set Point** command allows a new point to be created at specific coordinates, or an existing point to be moved to specific coordinates. Each new point is automatically created as an active point and may be manipulated with the editing commands immediately.

To create a point at a specified location:

- Choose **Edit - Set Point**.

  A requester will appear asking for the X, Y, and Z coordinates to place the point.

- Enter the coordinates and set the **Scale** if you wish.

  The edit fields can be reset to **0** by clicking on **Clear**.

- Click on **New**.

  This tells Modeler 3D that the point is to be created (as opposed to moved).

To move a point or points to a specified location:

- Select the point(s) you wish to move.
- Choose **Edit - Set Point.**

  A requester will appear asking for the X, Y, and Z coordinates you wish to move the selected point(s) to. The last point you select will be moved to the given coordinates, with the rest moving relative to it.

- Enter the coordinates the point should be moved to and set the **Scale** if you wish.

  The fields can be reset to **0** by clicking on **Clear**.

- Click on **Move**.

  This tells Modeler 3D that the points are to be moved as opposed to created.

Point Info

This function provides X, Y, and Z coordinates of selected points. The next selected point in an active set is examined by clicking the **Next** button, and **Previous** examines the previous point. The positions of these points may be changed by changing the coordinates displayed for them.

This command affects points in any mode.

To examine the coordinates of selected points:

- Choose **Edit - Point Info**.

  A requester will appear showing the X, Y, and Z coordinates of the selected point if only one is selected, or the first in a list if many are selected.

- Change the contents of the edit fields to move the point, and set the **Scale** if you choose.

- If you would like the point to be moved to the center of the Modeler 3D universe, choose the **Clear** button to set all the edit fields to **0**.

- Click **Next** or **Previous** to move through a series of points. Make whatever changes you like to each one, or cancel to leave points intact.

- Select **OK** to approve the changes and return to the editing window.

Polygon Info

The **Polygon - Info** command displays the **Color**, **Flatness** and number of **Vertices** (or points), that make up the polygon.

Set Color

The **Set Color** command allows you to change the color of selected polygons.

To change the color of selected polygons:

- Choose **Edit - Polygon - Set Color**.

  The Polygon Color requester will appear.

- Choose the type of surface (Matte, Glossy, Unshaded, or Outline) by clicking on the appropriate button.

- Select **Transparent** or **Opaque** and turn **Smoothing** on if you like.

- Click on the (***) button to call up a color chart along the bottom of the screen (refer to **Appendix F: The Color Chart** for a complete list of colors). Choose a color by clicking on it.

  Color may also be set by typing the color code into the edit field to the right of the (***), or by clicking the **+** or **-** gadgets until the color code is reached. To make the polygon the default color (15 = white), click on the **Use Default** button.

- Select **OK** to accept the changes or **Cancel** to abort.

Note: Modeler 3D will only display numbers 0 through 15 in the edit field. Entering larger numbers will change the attributes and leave the actual color number in the field.

Flip

The **Flip** command causes the faces of active polygons to be flipped to the opposite direction.

To flip selected polygon(s):

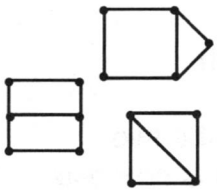
- Choose **Edit - Polygon - Flip** or press Amiga-F on your keyboard.

  The normals will flip to the other side. If you are using this command to make a two-sided polygon, be sure to **Merge Points** afterwards.

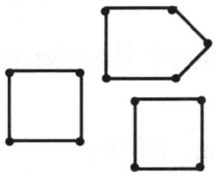
Merge

The Merge function allows two or more selected polygons to be fused together into one.

These...



...become these:



To merge polygons:

- Select two or more polygons you wish to merge. They all must share at least one edge.

  You can select more than one group of polygons to merge at one time, however, the polygons in each group must share at least one edge.

- Choose **Edit - Polygon - Merge**.

The two or more polygons you selected are now one.

Split

The **Split** function divides the selected polygon into two separate polygons. The division will occur between any two selected points.

To split a polygon:

- Select the two points which will serve as the dividing line.

  Split only considers the last two points selected. All others are ignored.

- Switch to Polygon Mode and select the polygon, making sure that it is the only one selected.

- Choose **Edit - Polygon - Split**.

  A line will appear connecting the two selected points. The polygon is now two pieces.

Select Vertices

The **Select Vertices** command causes all the points defining any selected polygon(s) to also become selected.

To select vertices of a selected polygon:

- Choose **Edit - Polygon - Select Vertices**.

  All points of the selected polygon(s) are now selected.

Remove Vertex

The **Remove Vertex** command takes any selected points out of an already defined polygon. This command works with any number of points and polygons in any mode.

To remove points from a polygon:

- Enter Polygon Mode and select the polygon(s).
- Switch to Point Mode and select all the points you wish to remove from the polygon.
- Choose **Edit - Polygon - Remove Vertex**.

  The points you selected are removed and the polygon is redrawn around the remaining points.

Insert Vertex

The **Insert Vertex** command is the exact opposite of **Remove Vertex**. It inserts an active point into an already defined polygon. Multiple points will be inserted in order and on multiple polygons, providing the edge to insert into each polygon goes through the same place on the screen.

To add a point to a polygon:

- Create or select a point in the place you wish to add it.
- Select the polygon you wish the point to be added to.
- Choose the place in the polygon you wish to insert the point. Do this by clicking the cursor on the edge that should be "looped around" the new point.

  The polygon will be redrawn to include the new point(s).

Default Color

The **Default Color** option allows you to set the color that all future polygons will become. This applies specifically to the objects in the **Generate** menu and the **Add Polygon** function.

To change the default polygon color:

- Choose **Edit - Default Color...**
- Click on the color attributes you wish to use and set the color bytyping its code in the edit field. The color amy also be set by choosing the three stars (***) beneath the word **Smoothing** and selecting a color.
- Choose **Use** to accept these settings, or **Cancel** to abort.

CHAPTER

7 Special Commands

In this chapter:
- Lathe
- Lathe Rules
- Extrude
- Extrude Rules
- Simple Extrude

Lathe

The **Lathe** function is used to create rounded shapes by rotating a "template." A template is a two-dimensional guide made up of points and polygons. The result of a **Lathe** depends on what the template is made of and what points or polygons are selected. For example, a point can make a disk-shaped polygon, a line can make a surface of revolution, and a surface polygon can make a series of flaps, such as the pages of a book with the front and back covers touching.

Lathe only operates from the **Template** window. The **Template** window is a two-dimensional view locked at 0 in the third dimension. For example, anything drawn in the **TOP** view has a **Y** coordinate of 0. You can also use a three-dimensional object drawn in the **Projection** window as a template (it

will be superimposed into a flat outline in the **Template** window). However, it is easier to create an object in the **Template** window where you only have to click once to enter a point. You can pick another view with the **Orientation** menu command (described in **Chapter 9: Display Commands**).

To lathe a template:

- Enter the **Template** window by choosing **Display - New Window - Template.**

  The **Template** window will appear. Unless you change the view orientation, you'll see the **TOP** view and its contents, if any.

- Create your template object if there isn't already one in the **Projection** window.

- Select the desired points or polygons. To select more than one polygon, hold down the SHIFT key while you click on them.

  The results of a **Lathe** can be very different depending on whether the template is made of points, lines, or surface polygons, and whether they're selected or not. (See **Lathe Rules** later in this chapter.)

- Choose **Lathe** from the **Generate** menu.

  The **Lathe** requestor will appear.

- Click in the desired edit fields, press the BACKSPACE and/or DEL keys to erase what's there and type new values.

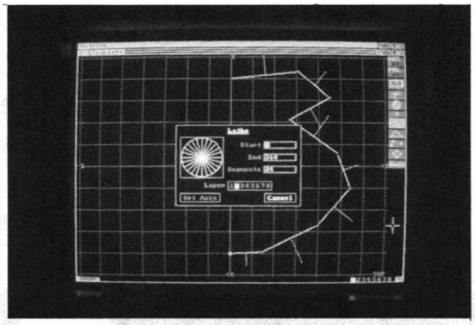


Fig. 7.1: The Lathe requester.

The wheel will change to reflect the new entries.

- Select the desired layer and click the **Set Axis** button. Clicking **Cancel** will abort the function.

A red line will appear attached to the cursor. This is the axis of rotation. As you move the cursor around the inside edges of a view, the line will change from vertical to horizontal and back. You'll see different results depending on whether you place the axis close to the template or far away.

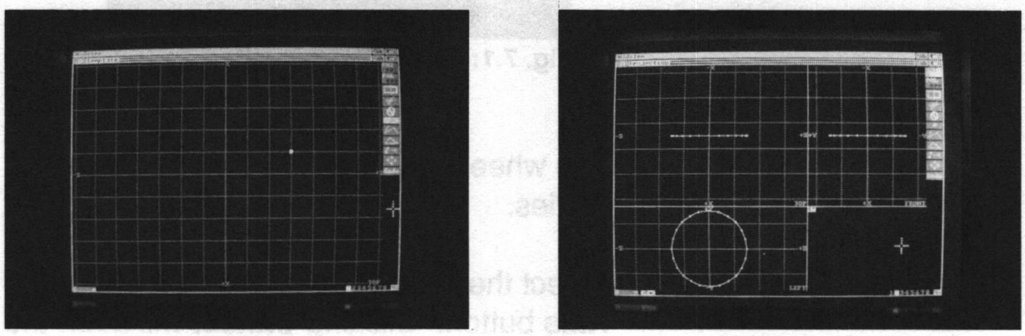
When the axis is in the desired orientation and position, click the Selection button. If you've decided not to continue, click in a blank space to abort.

You'll be able to see the resulting shape in the **Template** window when you go to the correct layer.

Lathe Rules

The following rules apply no matter which editing mode is selected when a template is **Lathed**:

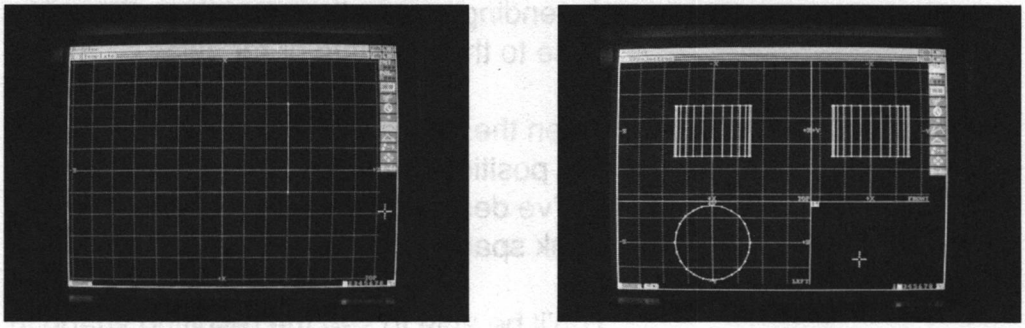
A selected point will be **Lathed** to make a circle:



BEFORE AFTER

Fig. 7.2: Lathe.

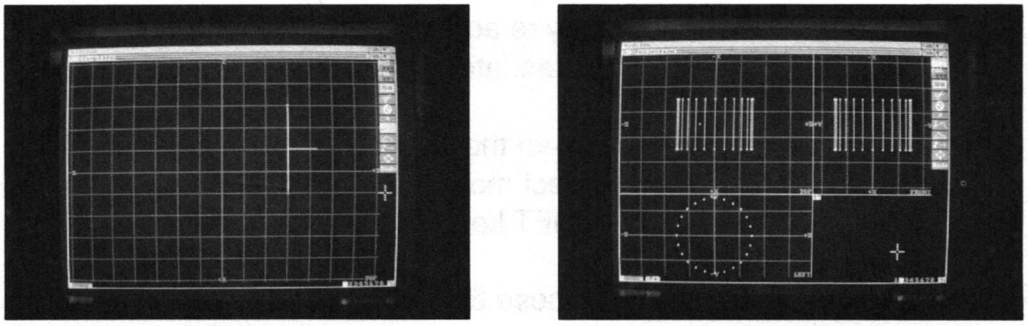
Lines are swept into surface polygons. Their visible faces are determined by their normals:



BEFORE AFTER

Fig. 7.3: Lathe.

Selected polygons are replicated at every step, including selected lines:



BEFORE AFTER

Fig. 7.4: Lathe.

Extrude

The **Extrude** function is used to create a 3-D solid shape from a 2-D template, a process similar to popping open a top hat. In all other respects, the Extrude function is similar to the **Lathe** function. **Extrude** only operates from the **Template** window.

To extrude a template:

- Enter the **Template** window by choosing **Display - New Window - Template.**

  The **Template** window will appear. Unless you've changed the view orientation, you'll see the **TOP** view and its contents, if any.

- Reselect the **Projection** window and create a new template (object) if necessary.

The results can be very different, depending on whether the template is made of points, lines, or surface polygons, and whether they're active or not. (See the **Extrude Rules** later in this chapter.)

- Select the desired points or polygons. To select more than one ~~point~~ polygon, hold down the SHIFT key while you click on it.

- Choose **Extrude** from the **Generate** menu.

The **Extrude** requestor will appear.

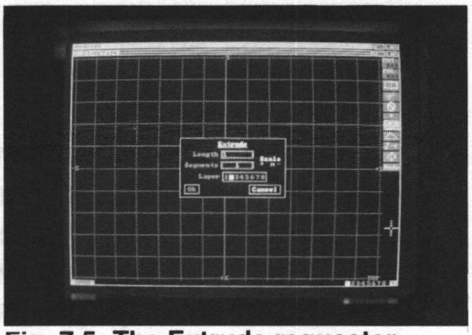


Fig. 7.5: The Extrude requester.

Fig. 7.5: ***Length*** *sets the length of the extrusion in meters unless the* ***Scale*** *has been changed.* ***Segments*** *divides the extrusion into segments by repeating the template the specified number of times.*

- Click in the desired edit fields and press the BACKSPACE and/or DEL keys to erase what's there so that you can type new values.

- Select the desired layer and select **Ok**. Or select **Cancel** if you change your mind.

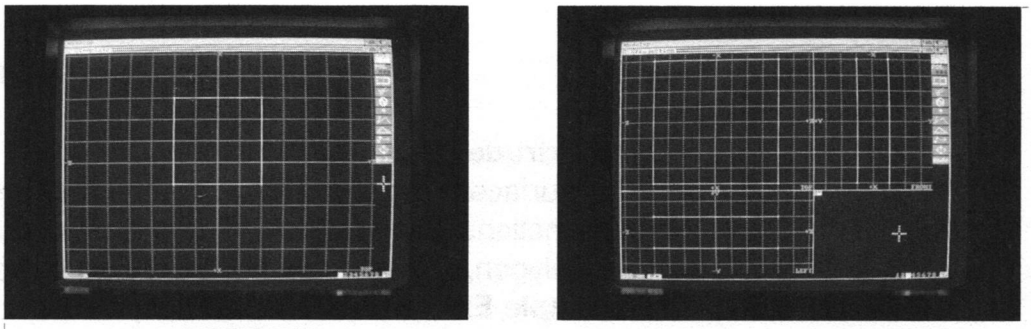
The shape will be extruded along the axis that points toward you. Therefore, you won't see anything different if you go to that layer in the **Template** view because you'll be

viewing the extruded shape head-on. Use a **Projection** window to view the entire object (you may have to **Auto Scale**).

Extrude Rules

Unselected lines are stretched into surface polygons to form the sides of the extrusion. Their visible faces are determined by the normals.

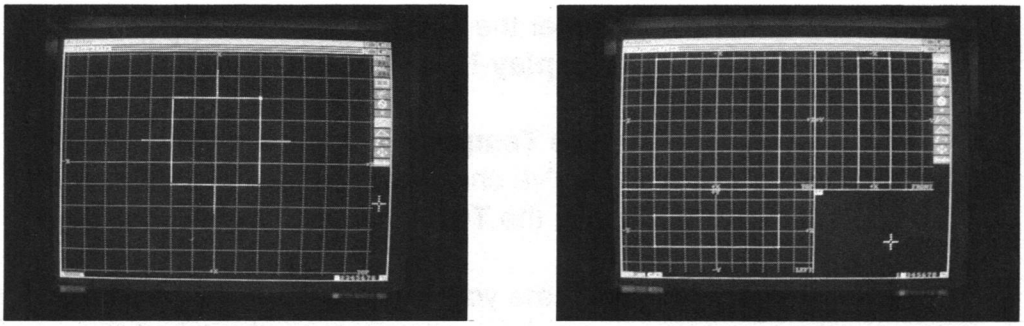
Selected lines are replicated at each step, instead of being stretched into a solid polygon:



BEFORE AFTER

Fig. 7.6: Extrude.

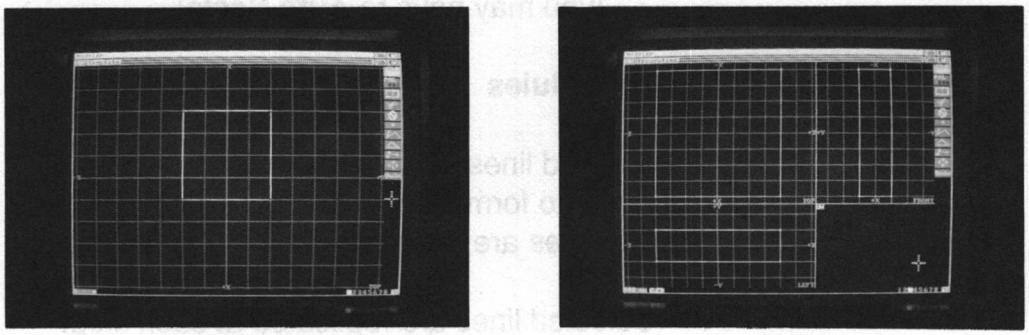
Selected surface polygons are replicated at every segment and the extrusion has no sides:



BEFORE AFTER

Fig. 7.7: Extrude.

Unselected surface polygons appear only at the ends of an extruded object:



BEFORE

Fig. 7.8: Extrude.

AFTER

Simple Extrude

Simple Extrude, similar to Extrude, is meant for use with surface polygons. The difference between the two functions is that when **Extrude** is used on a surface polygon, the extruded shape has no sides. When **Simple Extrude** is used, the shape is an enclosed volume. **Simple Extrude** only functions from the **Template** window.

To use Simple Extrude:

- Enter the **Template** window by choosing **Display-New Window-Template.**

  The **Template** window will appear. Unless you've changed the view orientation, you'll see the **TOP** view and its contents, if any.

- Create your surface polygon (or polygons) if you didn't already have them in the

Projection window. (The results will be the same whether or not the polygons and points are selected.)

- Choose **Simple Extrude** from the **Generate** menu.

  The same requester used for **Extrude** will appear.

- Click in the desired edit fields and press the BACKSPACE and/or DEL keys to erase what's there so you can type new values.

- Select the desired layer and select **Ok**. Or select **Cancel** if you change your mind.

  The shape will be extruded along the axis that points toward you, so you won't see anything different if you go to that layer in the Template view because you'll be viewing the extruded shape head-on. Use a **Projection** window to view the entire object (you may have to **Auto Scale**).

CHAPTER

8 Input/Output Commands

In this chapter:

New...

The **New** command erases all foreground and background layers from memory and starts a new **Projection** window. A requester will appear asking if this is what you really want to do. The operation may be aborted by choosing the **Cancel** button.

Open Object

The **Open - Object** command will load VideoScape 3D objects as well as camera and object motion files, into Modeler 3D for editing. Camera and motion files will be converted into objects. These objects are recognizable by a **.geo** extension at the end of the file name.

Drawing

Open - Drawing allows an Aegis Draw drawing to be loaded into Modeler 3D as an object. The Aegis Draw file format is the same as Aegis Draw Plus and Aegis Draw 2000. You would use this option on drawings with straight lines and straight edged objects to be edited.

Plot

Open - Plot allows an Aegis Draw, Aegis Draw Plus or Aegis Draw 2000 plot to be loaded into Modeler 3D for editing. The main difference between loading a drawing and a plot is that a plot will include curved lines such as circles and splines. Once brought into Modeler 3D, the plot becomes an editable object, just like a drawing.

The plot must be saved in the Aegis Draw family using the **Modeler.plotdriver** included on the Modeler 3D disk (also on the Aegis Draw 2000 Data Disk). For instructions on installing a plot driver, refer to the *User Guides* of the respective programs. Plots can be quite large, so it may take a few moments for it to become visible after loading into Modeler 3D.

Modeler 3D will convert foreign formats into VideoScape 3D

When you are finished editing it, you can save it and plot it from Aegis Draw Plus or Aegis Draw 2000. (See **Save As - Drawing** later in this chapter for more details.)

Sculpt 3D

Open - Sculpt 3D allows any object created using the **.scene** format of Sculpt 3D to be loaded into Modeler 3D for editing. Sculpt 3D objects are made exclusively of triangles, many of which can be merged with the **Polygon - Merge** command. This will save memory and make working with them easier.

Polygons may need to be Flipped to make their visible sides face the right way because Sculpt 3D does not contain this information.

New Palette

Open - New Palette allows you to substitute an IFF program palette for the default Modeler 3D palette used in Modeler 3D's **Color Preview** and **Color Selection** screens.

To achieve the correct shading when displaying your object with VideoScape 3D, you need to know how VideoScape 3D uses its palette. First of all, although color codes for polygons are limited, each code uses several shades in the VideoScape 3D palette. Even more shades are used when you view the object in the VideoScape 3D Animation Window, depending on the contrast provided by the light source. The new shades are made by "dithering" (mixing) pixels of palette colors in varying amounts. In order for your palette to work

the same way, shades of a color must occupy side-by-side positions.

The best way to create your own palette is to load the VideoScape 3D palette into an IFF program which lets you edit color palettes, such as a paint program (Aegis Images, Deluxe Paint II, etc.). Now, because you can see which positions the shades of each color occupy, you can easily adjust them. If you changed the red shades into shades of brown, for example, polygons using the red color codes will appear brown when rendered in VideoScape 3D's Animation Window.

To edit the Modeler 3D/VideoScape 3D palette:

- Load a paint program that saves in IFF ILBM format (Aegis Images, Deluxe Paint II, etc.).

  There are two VideoScape 3D palettes: a 32-color palette for lower resolution displays and a 16-color palette for higher resolutions. Because Amiga programs tend to use different terminology to describe the same resolution, the following table shows which palette to use:

	Deluxe Paint II	Aegis Images	Aegis VideoTitler	Aegis VideoScape 3D
32ColorPalette.pic	Lo-Res Interlace	Images N/A	Lo-Res Video-Res	320x200,352x220,384x240 320x400,352x440,384x480
16ColorPalette.hpic	Med-Res Hi-Res	Images-HR N/A	Med-Res Hi-Res	640x200,704x220,768x240 640x400,704x440,768x480

- Open one of the palettes listed in the previous table, as a picture. You'll find the

files in the **PIC** directory on your Modeler 3D disk.

A group of spheres, each created with a different color code (from the matte group of colors), will appear. As you adjust the color palette you'll be able to see which color codes are affected. Higher color codes which correspond with the first 16 (such as glossy, transparent, etc.) are also affected.

When you're done, save your new palette as an IFF picture under another filename.

Note: You can also save your palette as a color palette file if your program has that capability. However, VideoScape 3D and Modeler 3D may not be able to read it because palette formats tend to vary from program to program. It's more reliable to save your palette as an IFF picture.

To open a new palette in Modeler 3D:

- Choose **Open - New Palette** from the **Project** menu.

  The storage requester will appear.

- Open the IFF file containing your palette.

  Modeler 3D will extract only the color palette and ignore the rest of the file. This palette will remain in effect until a new one is loaded.

To return to the default VideoScape 3D/ Modeler 3D palette:

- Choose **Open - New Palette** from the **Project** menu.

  The storage requester will appear.

- With no filename selected, click **OK**. The default palette will be restored.

Save

Choosing **Save** will cause Modeler 3D to save the foreground layer(s) under the name of the last object saved or loaded. If no object was previously loaded, you will be prompted to enter a filename.

Caution: Saving a new file with an existing filename will erase the old file permanently.

A requester will appear asking if you are sure you want to overwrite the old file. Selecting **OK** will proceed with the **Save**. Selecting **Cancel** will abort the operation and leave the old file intact.

Save As...

Binary

This command will cause Modeler 3D to save the foreground layer(s) as a **Binary** format object file. These files load quicker and take up less room on a disk (but cannot be edited with a text editor). Save the final versions of your objects as binary files whenever possible.

Text

This command will cause Modeler 3D to save the

foreground layer(s) as a **Text** format object file. These files load more slowly and take up quite a bit more space on a disk than **Binary**, but may be edited with a text editor. The VideoScape 3D *User's Guide* details how to edit object files in a text editor.

Motion

Note: Modeler motion files may be used as either camera or object motion files in VideoScape 3D.

This command will cause Modeler 3D to save the foreground layer(s) as a **Motion** file for use with VideoScape 3D.

Defining A Motion

A motion file describes the position of key frames within a motion and the number of moves, or "tweens," between each key frame. You can create a motion file in Modeler 3D by using the Curve tool to set down vertices representing the key frames in the order they will be visited. Each time you create a vertex in Curve mode, Modeler 3D will create a line between this vertex and the last one created. The lines are actually two-point polygons, but the resulting curve will be the path defined by the motion.

Note: Modeler 3D will only display numbers 0 through 15 in the edit field. Entering larger numbers will change the attributes and leave the actual color number in the field. When setting tweens, enter the desired number and ignore what is in the edit field.

Set the number of tweens between each individual pair of key frames by entering the desired number in the **Edit - Polygon - Set Color** requester. Setting the **Modify - Default Color** will cause all your tweens to be the same length.

EDIT

Just remember that the last point selected will be where your motion will start. Modeler 3D will follow the motion by finding two-point polygons attached to the selected point and tracing them until they stop.

Setting Direction

The **Save As - Motion** command offers a number of options when saving. These options determine the direction the object (or camera) will point as it moves on its motion ~~file~~ path.

Fixed Angle causes the object (or camera) to always sit at a particular angle as it follows the path. The angle is set by entering the heading, pitch, and bank amounts in the **H**, **P**, and **B** edit fields.

Tracking Fixed Point causes the object (or camera) following the path to point at one spot the entire time. Specify this point using the **X**, **Y**, and **Z** edit fields to enter the point to watch.

Tangent To Path will cause the object (or camera) to face the direction it is traveling on the motion. **Lookahead** specifies the fraction of the distance to the next key frame. The default value of 0.1 has the motion pointed at a spot 1/10 of the way along the path to the next key frame.

Tracking Another Motion tells the object (or camera) to always point at corresponding frames of another motion file. Choosing this option brings up a storage requester to determine which other motion is being tracked.

Drawing

Save As - Drawing will cause Modeler 3D to save the foreground layer(s) of the upper left view as an Aegis Draw family format drawing.

Save - Settings

The **Save - Settings** command causes the following settings to be saved as a configuration file for the next time you load Modeler 3D:

Preview Window On/Off and position (if Save - Settings is chosen from a window with Preview currently attached).

Preview flags: back face removed/dithered solid/wire frame.

Screen Color	**Visible Items (from Display Menu)**
Coordinates On/Off	**Default Polygon Color**
Scale	**Window orientation**
Merge distance	**Grid Size**
Grid Snap	**Screen Type**

If this option is chosen from the **Template** window, the settings will become the default for **Template** windows. If it is chosen from the **Projection** window, the settings will become the default for **Projection** windows.

CHAPTER

9 Display Commands

In this chapter:

- **Zoom**
- **Auto Scale**
- **New Window**
- **New Projection Window**
- **New Template Window**
- **New PreviewWindow**
- **New Color Preview Window**
- **New Statistics Window**
- **Coordinates**
- **Orientation**
- **Visible Polygons**
- **Visible Points**
- **Visible Detail**
- **Visible Normals**
- **Visible Axis Labels**
- **Visible Grid**
- **Visible View Labels**
- **Grid**
- **Screen Colors**

Zoom

The **Zoom** function allows you to take a closer look at your object or move further from it. This is handy when working with a complex object with hundreds or thousands of points and polygons.

It is important to remember that **Zoom** is changing camera lenses and not moving the object. This is perhaps most obvious in the **Zoom - Manual** mode. Here, a frame is set down representing the frame of the view being used. **Zoom - Out** will cause the view to shrink to the size of the frame you defined, while **Zoom - In** will enlarge the frame to fill the view. You can **Zoom** by factors of 1.4, 2, or whatever you determine in **Manual** mode.

To zoom in or out by a factor of 1.4:

- Select **Zoom - In** or **Zoom - Out** from the **Display** menu or press the Amiga **>** or Amiga **<** keys on your keyboard.

  Objects will be redrawn 1.4 times larger or smaller in the **Projection** window.

To zoom in or out by a factor of 2:

- Press SHIFT **>** or SHIFT **<** key on your keyboard.

  Objects will be redrawn 2 times larger or smaller in the **Projection** window.

To zoom in or out manually:

- Choose **Zoom - Manual** from the **Display** menu or press Amiga- M on your keyboard.

  A red frame will appear attached to the cursor. Notice that as you move from view to view the frame changes its scale to fit the window shape. This is because the frame represents the outline of that window.

- Set the frame down around your object to show how big the object should be in that view. The amount of the red frame that is filled with your object will correspond to the new size of the object in the window. If you are zooming out, the frame represents what

size the current view will be after the function is used.

- A red dotted frame will appear where the solid frame was.

  Now move the solid frame inside the dotted frame to **Zoom In**, or outside the dotted frame to **Zoom Out**.

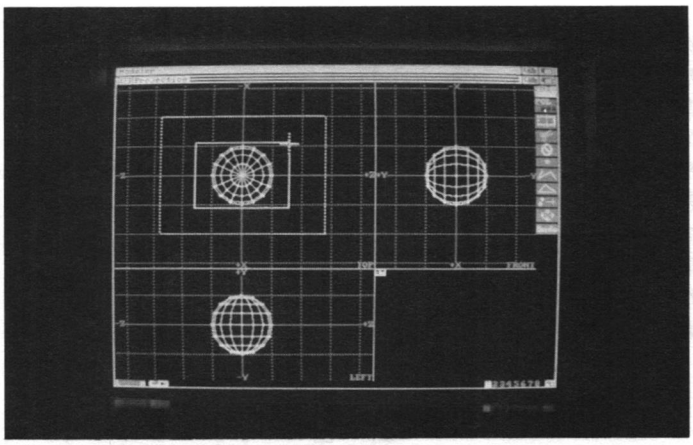


Fig. 9.1: Zoom.

The object will be redrawn at the size specified.

Auto Scale

The **Display - Auto Scale** function automatically centers the current layer(s) in all three views.

If the view seems to have zoomed out too far, this may be due to the shape of your view windows. Since **Auto Scale** fits the entire object in each view,

the window shape is best kept consistant with the shape of the object in it. For example, a skyscraper would use a tall **LEFT** view, a long **FRONT** view, and a small **TOP** view. If you were to use a small **FRONT** view, the skyscraper would appear scaled to fit in that view, and the **LEFT** and **TOP** views would show a tiny skyscraper.

*Note: Modeler 3D's **Projection** and **Template** windows are independent. **Preview** and **Statistics** windows, however, must be attached to a **Projection** or **Template** window.*

New Window...

Projection

Modeler 3D starts with a single **Projection** window open. Its three views allow layers to be seen and modified from three positions: **TOP**, **LEFT**, and **FRONT**.

Template

The **Template** window is a 2-D workplace. Here, points may be placed without having to click in two views. Since the **Template** window is 2-D, the resulting design will be planar. **Lathe**, **Extrude**, and **Simple Extrude** require you to use the **Template** window as their base of operations.

Preview

The **Preview** window allows the user to look at the contents of the layers selected in the associated **Template** or **Projection** windows as solid or wire frame objects. This window will only display objects in two colors (regardless of how many are actually

in the object). Clicking in the window around the objects will move your "camera" in the direction specified.

Options of **Solid** or **Wire Frame** in the **Display** menu of the **Preview** window let you choose which way to display your objects. **Back Faces - Dithered** and **Back Faces - Removed** will cause the non-defined sides of polygons to appear "ghosted" or not to appear at all, respectively.

This window may be resized and kept open while you are editing your object. As you make changes, just click in the **Preview** window and the drawing will be updated.

Color Preview

Color Preview works exactly the same way as **Preview**, but will display objects in their true colors. While shading will not be visible here, VideoScape 3D will render the object with the proper shading.

Statistics

The **Statistics** window contains information on the foreground layers of the associated **Template** or **Projection** windows. Clicking on any button will select that item. **Statistics** gives you the total number of points and polygons as well as the number of polygons containing a particular number of points, and the number of the polygons of the default color.

Coordinates

Selecting this option from the **Display** menu, or choosing the **Grid** gadget, will turn the **X**, **Y**, and **Z** coordinates display in the lower left corner of the screen on or off.

Orientation

The **Orientation** command allows you to change the direction a layer is viewed from. Each view may be adjusted individually by selecting the box corresponding to it. The actual rotation process is like a Rubik's Cube in that one "side" is turned at a time.

To change the orientation of a layer:

- Choose **Orientation** from the **Display** menu.

  The **Orientation** requester will appear.

- Click in the box corresponding to the view you wish to rotate.

  The box will become filled.

- Click on the rotation buttons until the **X, Y,** and **Z** axes point in the direction you wish.

- Select **OK**.

Visible

The **Display** - **Visible** sub-menu contains a list of attributes of the display. Any of these items may be turned on (visible) or off (invisible) by selecting them.

Polygons will turn polygons on or off.

Points will turn points on or off.

Detail will turn detail polygons on or off.

Normals will turn normals on or off.

Axis Labels will turn the **X, Y,** and **Z** labels of the grid on or off.

Grid will turn the grid on or off.

View Labels will turn the labels showing the viewing direction (**TOP**, **LEFT**, etc.) on or off.

Grid...

The **Grid** function allows the size of the grid and the amount of grid snap to be changed. The grid may be adjusted by dragging the **Ideal Grid Size** slider. Moving the slider to the left will result in a very fine grid, while moving it to the right will produce a larger one. Moving one increment at a time can be done by clicking to the right or left of the slider.

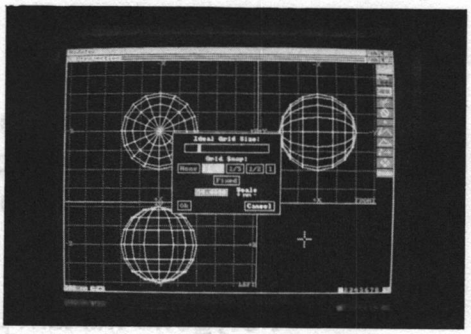


Fig. 9.2: The Grid requester.

For more accuracy, the buttons beneath **Grid Snap** let you determine the number of intervals at which coordinates snap. For example, if you select **1/10**, there will be 10 places between each grid intersection where coordinates could snap to. You can select **1/10**, **1/5**, **1/2**, or **1** division, or you can set your own divisions with the **Fixed** option. This will set an absolute grid snap.

Screen Colors

Note: Be careful when defining colors - screen display will be affected, too!

The **Screen Colors** option allows you to adjust the colors Modeler 3D uses for the display. This is done using the standard **R**ed, **G**reen, and **B**lue sliders. These will now become the default colors.

Screen Type

Note: If there isn't enough memory available for an interlaced screen when Modeler 3D is booted, a lower resolution screen will be loaded.

Screen Type contains three options: **Interlace**, **Non-Interlace**, and **Workbench**. Choosing one of these will cause Modeler 3D to use the corresponding screen type for display. The default is **Interlace**, which is the most memory intensive, but also the most accurate.

APPENDIX A

Orthographic Projection

When you use Modeler 3D or VideoScape 3D, the Amiga monitor is like a window into another world. In Modeler 3D's **Preview** windows, you can view objects from any angle. In VideoScape 3D's Animation Window, objects take on a lifelike appearance with directional shading and complex motions. Because this is only a 2-D simulation of 3-D reality, we can't carve objects for the computer to use. But we can enter 2-D views in Modeler 3D's **Projection** window to be assembled into a 3-D object.

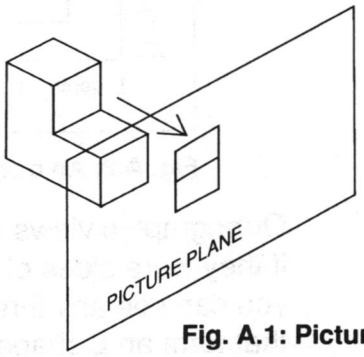


Fig. A.1: Picture Plane

"Orthographic projection" is a method used by engineers and designers to describe the shape and size of a 3-D object on paper. An orthographic view is made by projecting lines of sight from a side of an object to where they intersect an imaginary picture plane. These lines are always parallel to each other and perpendicular to the picture plane. An orthographic ("orthogonal") projection gives information about the height, width, and depth of an object. Each view can only describe two of these components at a time: a front or back view describes height and width, a top or bottom view describes width and depth, and side views describe depth and height. So, at least two views at right angles to each other are needed to give complete information about an object.

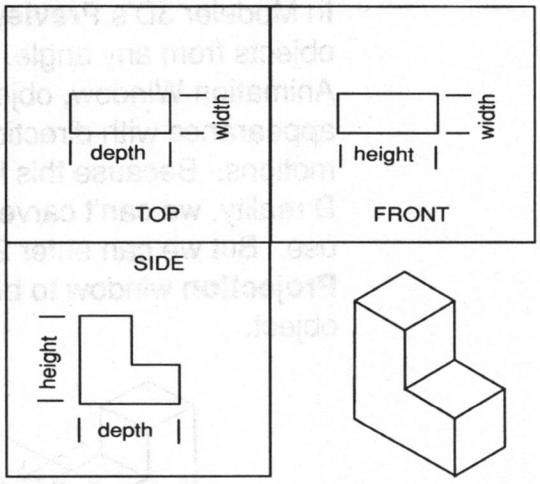


Fig. A.2: An orthographic view.

Orthographic views are oriented with each other as if they were sides of an unfolded box. In Modeler, you can see any three sides of the "box" at a time that form an L shape. For example, you can see the

FRONT-TOP-LEFT or **FRONT-BOTTOM-LEFT** combination, but not the **BOTTOM-FRONT-TOP** because this leaves out the depth-versus-height description. If you mentally fold the views to form the box, you can visualize a pictorial representation of the object.

A solid line in an orthographic drawing (on paper) can be either the edge of a surface or where a curved surface drops off from view. In addition, dotted lines show what lines are hidden behind a surface in that view. A solid line in Modeler 3D's **Projection** window only shows the edge of a surface. This is because objects — even rounded ones — are composed entirely of flat surfaces called polygons. There are no hidden lines in the **Projection** window because polygons are transparent. Dotted lines indicate polygons that have been attached to other polygons as details.

Note: It's possible to have a bent (nonplanar) polygon, but not advisable because VideoScape 3D may not be able to display it correctly.

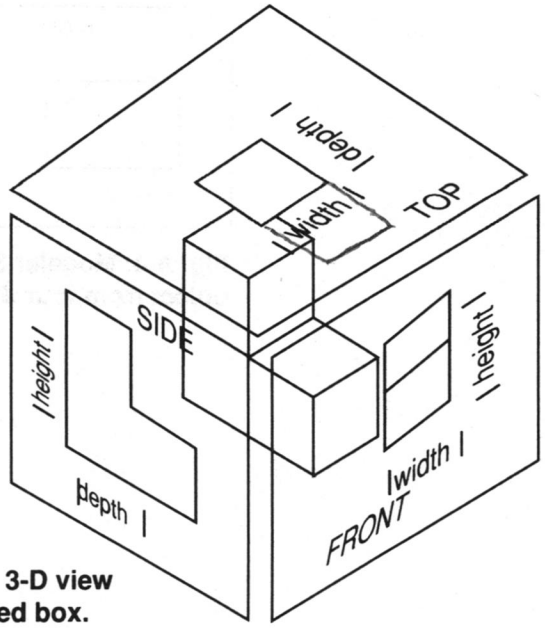


Fig. A.3: 3-D view of a folded box.

Being able to look at an orthographic projection and visualize how the object will look is a skill that requires practice. The task is even more complex if there are surfaces on the object that are not parallel with any of the picture planes. These "oblique" surfaces are foreshortened in every view so that it's difficult to determine their true size and shape. Luckily, we can avoid such mental struggle by having Modeler 3D's **Projection** and **Preview** windows open at the same time. This way, as we build the object, we can have instant pictorial feedback.

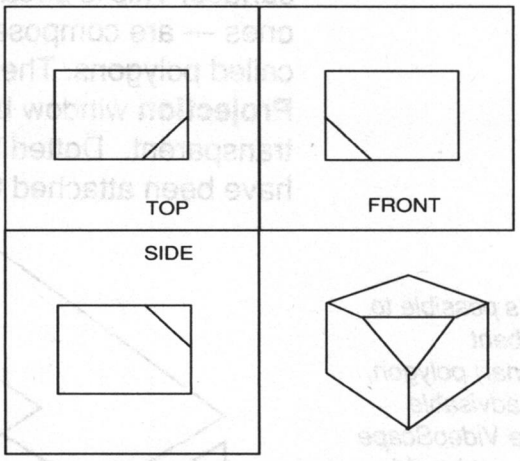


Fig. A.4: Modeler 3D can diplay the object from four different views.

APPENDIX B

Thinking In 3D

The information in this chapter can also be found in the Aegis VideoScape 3D *User's Guide*. It is an explanation of how to think in terms of three dimensions: width, height and length, also known as **X, Y,** and **Z**.

When you make an object in Modeler 3D, you are dealing with width, height, and length. In the example below, you can see that although height, width and length are sufficient for defining the size and shape of the three dimensional box, they are not sufficient for describing its location.

A Firm Framework

A firmly anchored framework with a starting point from which width, height and length can be measured is needed to establish location. Such a

framework exists in the concept of the **X**, **Y** and **Z** axes. The axis where these dimensions meet is called the Origin.

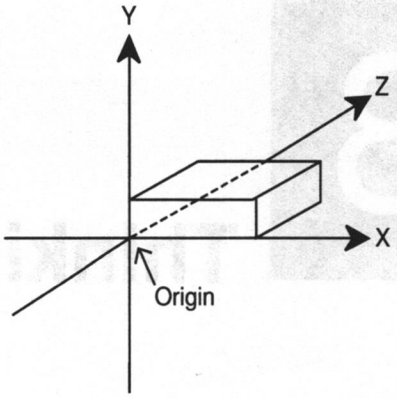


Figure B.1: The Origin and the X-Y-Z Axes.

Notice in **Figure B.1** that by starting at the Origin (where the axes intersect) you can not only measure width, height, and length but you can also define the precise location of any point or object relative to the entire framework. Each axis passes right *through* the Origin and continues on to infinity. Take the Y axis, for example: If measurement from the Origin is to have much meaning, the question must be answered, "Measurement in which direction? Up or down?" To resolve this ambiguity one more convention must be established: The idea of negative direction. Happily, this convention has already been worked out. The Y axis below the Origin, the X axis to the left of the Origin and the **Z** axis in front of the Origin (toward the viewer) are negative.

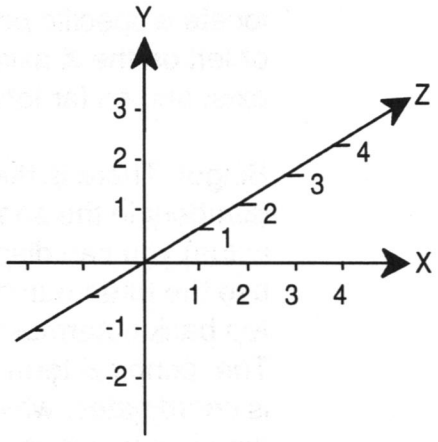


Figure B.2: Positive and Negative Directions of the X-Y-Z Axes.

Starting at the Origin and measuring out along any of these negative axes, the numbers would be -1, -2 and so on, getting larger as you go farther from the Origin (see **Figure B.2**). The numbers up, right and back from the Origin (away from the viewer) are positive. You can see that this framework of axes creates a three-dimensional volume, or a "universe."

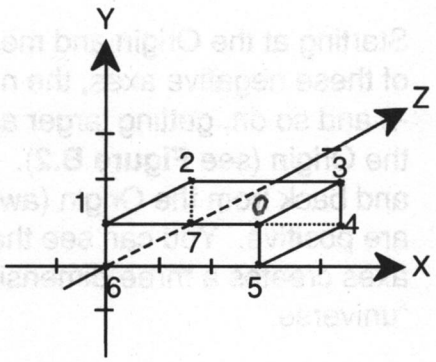
Locations Within the Framework

One more key factor is necessary to complete the concept of a universe and make it a truly useful thing. We need a firmly agreed upon convention for describing a location (a point) within the volume. Such a convention already exists. The Coordinate System provides us with one. It works on the simple priciple that any point in the volume can be described with three measurements (numbers), one for each axis (**X**,**Y** and **Z**). In other words, to

locate a specific point you just measure so far right or left on the **X** axis, so far up or down on the **Y** axis, and so far forward or back on the **Z** axis.

Bingo! There is the point. By always writing the numbers in the same order (**X** value, **Y** value, **Z** value) you can dispense with the letters and just use the three numbers. For example, **3 1 2** is the top back outermost corner of the box in **Figure B.3**. The technical term for these sets of three numbers is coordinates, which is appropriately taken from the Latin words meaning "same orderly arrangement."

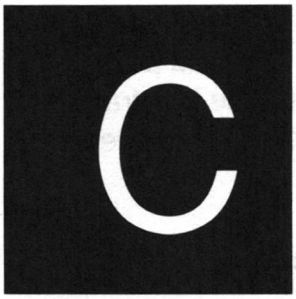
Note: Although standard convention calls for separating the numbers with commas. However, they must be separated by a space when used in a text geometry file for Modeler 3D and VideoScape 3D.



Coordinates:
Point 0: (3 1 0)
Point 1: (0 1 0)
Point 2: (0 1 2)
Point 3: (3 1 2)
Point 4: (3 0 2)
Point 5: (3 0 0)
Point 6: (0 0 0)
Point 7: (0 0 2)

Figure B.3: Finding a Point's Coordinates.

APPENDIX



Motion In VideoScape 3D

Start and End Positions: The Key to Motion

The key concepts applying to these motion instructions are that a motion starts with a frame in which the object or camera has a certain position/ orientation and ends a number of frames later with the object or camera in a different position/ orientation.

The descriptions of object or camera position at the start and end of the motion are called "key frames," and the span of frames between them are called "tweens." To describe a motion all you have to do is describe the object or camera's position in the key frames and specify how many frames the program is to generate in-between. VideoScape 3D will perform all of the interpolative calculations necessary to producing, within that number of

frames, a smooth, animated illusion of motion. Within any single motion file you can have up to 50 key frames, or 49 tweens. Thus objects and camera can folllow remarkably complex paths of motion as they are directed from one key frame position/orientation to another and so on over the course of a single scene.

Positional Motion

Positional motion consists of moving an object from one place to another by first giving the **X**, **Y** and **Z** coordinates of its location at the start of the move and then giving the **X**, **Y** and **Z** coordinates of its location at the end of the move.

A Stable Reference Point

The reference point Modeler 3D uses to know an object's location is the point, in relation to the object, having the coordinates 0 0 0 at the time the object was created. You might recognize that the point 0 0 0 is also known as the Origin of the axes. This point does not have to be part an actual point when constructing an object. Neither does it have to be inside the object, although this is usually a good idea.

Pivot Point

There is one last major factor related to the matter of movement, and of particular importance to the matter of heading, bank and pitch: knowing the precise placement relative to the object of the axes

about which they are rotating - in other words, the pivot point. The answer to this question may sound familiar. The pivot point is that point relative to the object when it was created and first loaded into a scene, having the **X**, **Y** and **Z** coordinates of 0 0 0 (otherwise known as the Origin).

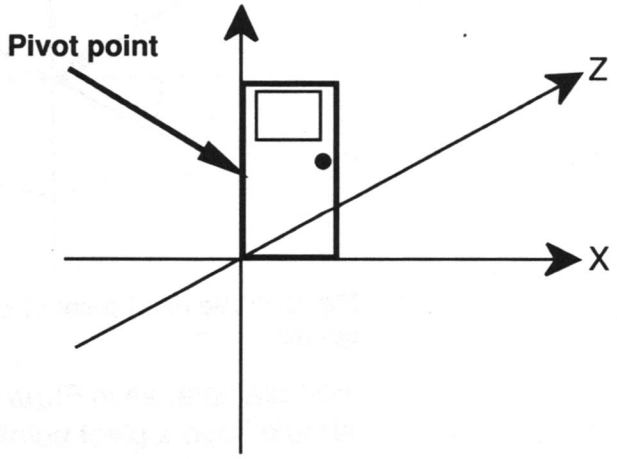


Figure C.1: The pivot point does not have to be inside the object.

This point does *not* have to be part an actual point when constructing an object, neither does it have to be inside the object. An exception would be in the case of a door, which should pivot around an axis running straight along its hinged side (see **Figure C.1**). For most objects you should create them relative to the Origin so that the pivot point falls at their imagined center of gravity.

The pivot point travels along with an object as it is moved in a VideoScape 3D scene. The pivot point also moves with an object if the object is placed away from the Origin when it is loaded using the manual object motion requestor.

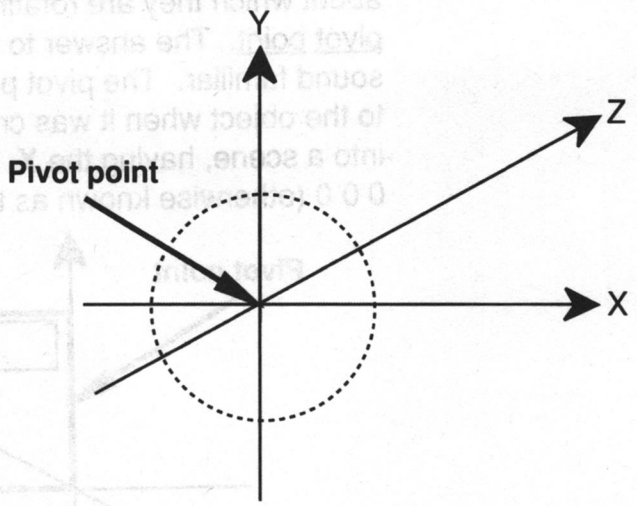
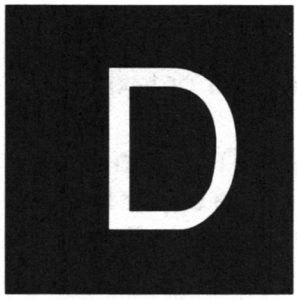


Fig. C.2: The pivot point of a snowball should be in it's center.

For example, as in **Figure C.2**, a rolling snowball should have a pivot point at its center if it is to roll correctly. However, if it is loaded without offsetting it, it would appear half-embedded in the ground. The manual object motion requestor (or an object motion file) should be used to raise it above the ground by an amount equal to its radius.

APPENDIX



Menus and Keyboard Commands

Project Menu		Page
New...	Clears a set of layers to create objects.	**8-1**
Open		
Object...	Opens a requester to load a previously created Modeler 3D or Aegis VideoScape 3D object.	**8-1**
Drawing...	Opens a requester to load an Aegis Draw family drawing as an object.	**8-2**
Plot...	Opens a requester to load an Aegis Draw family plot as an object.	**8-2**
Sculpt 3D...	Opens a requester to load a Sculpt 3D object for translation into a VideoScape 3D object.	**8-3**
New Palette...	Opens a requester to load a new color palette.	**8-3**
Save...	Saves the foreground layer(s) to disk. If you have not yet saved your file, you will be asked to name and direct your file to the disk/drive you want to save it to.	**8-6**
Save As		**8-6**
Binary...	Will Save the foreground layer(s) in Binary format. Opens a requester to name your file and select	**8-6**

		Page
	where to save it to (df1:, dh0:, etc.). This may also be used to Save an existing file under another name.	
Text...	Will Save the foreground layer(s) as a Text file. You can then edit it in a word processor or text editor.	**8-7**
Motion...	Will Save a curve as a VideoScape 3D motion file.	**8-7**
Drawing...	Will Save the foreground layer(s) in the upper left view as a Drawing to be plotted in an Aegis Draw family product.	**8-9**
Save Settings	Saves the screen colors, grid size and snap, zoom, etc., in a separate file.	**8-9**
About...	A message containing the name of the author, the version number of Modeler 3D you are using and the current free memory status.	**1-6**
Quit...	Asks if you've saved your work, then leaves Modeler 3D and returns you to the Workbench.	**1-7**

Edit Menu

Undo	Reverses your last action.	**2-9**
Delete	Removes active items from the foreground layer(s).	**5-1**
Cut...	Removes active items from the foreground layer(s) and places them in another layer.	**5-2**
Copy...	Makes a copy of active items in the foreground layer(s) and places them on another layer.	**5-3**
Select		
Point	Selects points defined by a current volume, or all points if no volume is defined.	**6-1**
Polygon	Selects polygons defined by a current volume, or all polygons if no volume is defined.	**6-2**
Set Point...	Allows you to create a point at specified **X**, **Y**, and **Z** coordinates.	**6-3**

		Page
Point		
Info...	Displays the **X**, **Y**, and **Z** coordinates of active points and allows them to be moved.	**6-4**
Translate To Center	Allows you to choose a point in an object to be the center of rotation when animated in VideoScape 3D.	**5-13**
Polygon		
Info...	Allows you to directly manipulate or get information about selected polygons.	**6-5**
Set Color...	Allows you to change the color of a polygon(s).	**6-6**
Flip	Flips selected polygon(s) to face the opposite direction.	**6-7**
Merge	Combines selected polygon(s) sharing edges into one polygon.	**6-7**
Split	Divides selected polygon(s) into two separate polygons.	**6-8**
Select Vertices	Selects all points defining selected polygon(s).	**6-8**
Remove Vertex	Removes selected point(s) from selected polygon(s).	**6-9**
Insert Vertex	Adds selected point(s) to selected polygons(s).	**6-9**
Default Color...	Sets ~~color~~ Modeler 3D will ~~generate polygons in~~.	**6-10**

Display Menu

Zoom		
In	Zooms in by a factor of 1.4 or 2, making an object appear larger for precise editing.	**9-1**
Out	Zooms out by a factor of 1.4 or 2, making an object appear smaller.	**9-2**
Manual	Allows the zoom factor to be changed by a specified amount.	**9-2**
AutoScale	Centers your object(s) and sizes them to fit in all views.	**9-3**
New Window		
Projection	Opens a three-sectioned editing window.	**9-4**
Template	Opens a window containing a single view for 2-D editing.	**9-4**

		Page
Preview	Opens a window containing a one-color solid or wire frame rendition of your object(s).	**9-4**
Color Preview	Opens a window containing a full-color solid or wire frame rendition of your object(s).	**9-5**
Statistics	Opens a window containing the point and polygon count, default color, and number of vertices per polygon.	**9-5**
Coordinates	Toggles the coordinate display on or off.	**9-6**
Orientation...	Allows the view directions to be changed.	**9-6**
Visible		
Polygons	Toggles polygons visible and invisible.	**9-7**
Points	Toggles points visible and invisible.	**9-7**
Details	Toggles detail polygons visible and invisible.	**9-7**
Normals	Toggles normals visible and invisible.	**9-7**
Axis Labels	Toggles XYZ axis labels visible and invisible.	**9-7**
Grid	Toggles grid visible and invisible.	**9-7**
View Labels	Toggles view direction labels visible and invisible.	**9-7**
Grid...	Allows size of grid and amount of grid snap to be changed.	**9-7**
Screen Colors...	Supplies color sliders to set new screen colors.	**9-8**
Screen Type		
Interlace	Operates Modeler in Interlace mode.	**9-8**
Non-Interlace	Operates Modeler in Non-Interlace mode.	**9-8**
Workbench	Operates Modeler on the Workbench screen.	**9-8**

Generate Menu

Lathe...	Allows a template object to be spun to form a rounded object.	**7-1**
Extrude...	Allows a template object to be stretched into a block.	**7-5**
Simple Extrude...	Allows surface polygons to be stretched into solids.	**7-8**
Sphere...	Generates a sphere to your specifications in the chosen layer.	**4-9**
Plane...	Generates a flat plane to your specifications in the chosen layer.	**4-9**

		Page
Box...	Generates a box to your specifications in the chosen layer.	**4-9**
Tube...	Generates an open-ended tube to your specifications on the chosen layer.	**4-9**
Inside Faces	Toggles Modeler 3D to create inside faces for the above objects, or not.	**4-11**

Modify Menu

point(s)

Rotate...	Rotates active point by any amount in a chosen view.	**5-7**
Translate...	Moves active points by a specified amount.	**5-8**
Scale...	Lets you change the **X**, **Y**, **Z** proportions of active points or polygons together or separately.	**5-9**
Remap...	Allows active points or polygons to be stretched, twisted, sheared, etc.	**5-10**
Merge Points	Eliminates duplicate active points or points determined to be too close to another.	**5-12**
Quantize	Snaps active points to their nearest grid intersections.	**5-13**
Change Color...	Allows one color to be swapped for another in active polygons. May also be used to make all active polygons one color.	**5-6**
Mirror...	Makes a mirror copy of active itmes around a specified axis.	**5-3**
Array...	Makes multiple copies of active items and offsets each from the last by specified **X**, **Y**, **Z** amounts.	**5-4**
Merge Distance...	Allows the factor determining what points should be merged with the Merge Points command to be set.	**5-14**
Set Center...	Lets you specify the location of the center of the current layer(s).	**5-15**

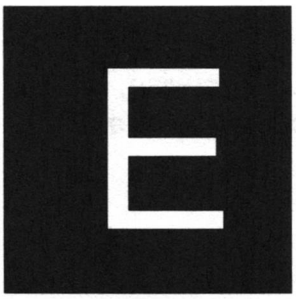
DOES NOT AFFECT POLYGONS.

Keyboard Commands

All keyboard commands listed below can be pressed alone or while holding down the Amiga or Commodore key.

A	AutoScale.
B	Save current layer(s) as Binary.
C	Copy active items from the current layer(s).
E	Go to Polygon Mode.
F	Flip faces of selected polygons.
G	Place the center of the display at the mouse pointer location.
I	Open Preview window.
J	Select Points.
K	Select Polygons.
L	Lock plane.
SHIFT-L	Restores last locked plane.
M	Manual zoom.
N	New (empties layers from memory).
O	Open an object file.
P	Create a new polygon from selected points.
Q	Quit.
S	Save foreground layer(s) under the name of the last file opened or saved.
T	Save foreground layer(s) as Text.
U	Undo.
V	Enter Exclusive Volume Mode.
Y	Enter Inclusive Volume Mode.
W	Go to Point Mode.
X	Cut active items into another layer.
Z or DEL	Delete active items.
>	Zoom in by a factor of 1.4.
<	Zoom out by a factor of 1.4.
SHIFT->	Zoom in by a factor of 2.
SHIFT-<	Zoom out by a factor of 2.
1 - 8	Moves to the corresponding layer.
SHIFT 1-8	Add corresponding layer(s) to display.
ALT 1-8	Put current layer(s) in the corresponding layer background.
SHIFT-ALT-1-8	Adds new ~~active~~ foreground layers.
Arrow Keys	Pan view area one grid space.
F1 - F10	Recall user-defined parameters.
SHIFT F1-F10	Saves parameters in a specified function key.

APPENDIX



Advanced User Tips

- Duplicate points may be used to make creases in a smoothed object.
- When making a glass object, make interior polygons. This gives the glass the proper look when rendered in VideoScape 3D.
- Shrink down the **Preview** window and put it in the blank space of the **Projection** window. You can then see how your latest changes look by simply clicking on the **Preview** window.
- Various settings of **Remap** may be used to create odd shapes. Jewels, balloons, barbershop poles, etc. can easily be created using this unique function.
- **Mirror** is very useful. Take a close look at the object you are recreating and see if you can

use this command. Drawing half an object and mirroring it takes only half the time.

- When merging points, try to use the volume to specify the area to merge. Otherwise, every point will be checked which may take a great deal of time.

- Run VideoScape 3D in the background. Design your object, move to VideoScape 3D, and choose the **Import Modeler Object** option. This will bring the current layer(s) of Modeler 3D into VideoScape 3D where you can see it rendered in color with real shading.

- An active point may be moved by holding the SHIFT key of your keyboard and clicking where you wish to put it. This is the same as choosing the **Move Points** tool, except no red movement line appears.

- If you plan to twist an object using the **Remap** command, break it down into triangular polygons. Otherwise, the polygons will likely become nonplanar which isn't very useful.

- Holding the SHIFT key down while selecting **Lock Plane** will restore the last locked plane.

- Sculpt 3D objects imported into Modeler 3D may not have their faces oriented to be visible since Sculpt 3D doesn't store that information.

- VideoScape 3D camera and object motion

files can be loaded into Modeler 3D, and will be converted into objects.

- Holding the SHIFT key down lets you select more than one polygon at a time.

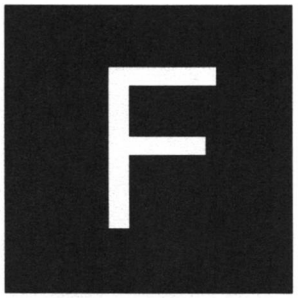
- If a set of polygons are to be set to the same color as another polygon, select the set to be changed, then select the other polygon whose color you are changing to. The **Set Color** requester will be set to the color of the last selected polygon. Clicking **OK** will set all the others to this color as well.

- The window parameters can be assigned to function keys. To do this, set up the window the way you want (zoom, scale, etc.), then, while holding the SHIFT key, press the function key you want to assign.

- Modeler 3D remembers keystrokes and mouse clickswhen typed in rapid succession.

- ESC makes all layers foreground layers.

APPENDIX



The Color Chart

FOR COMBINED SHADING TYPES, ADD THE COLUMNS TOGETHER. FOR EXAMPLE, SMOOTH GLOSSY BLACK WOULD BE 16 + 128 = 144.

	Matte	Glossy	Unshaded	Outline	Transparent	Smooth
Black	0	16	32	48	64	128
Dk. Blue	1	17	33	49	65	129
Dk. Green	2	18	34	50	66	130
Dk. Cyan	3	19	35	51	67	131
Dk. Red	4	20	36	52	68	132
Dk. Purple	5	21	37	53	69	133
Brown	6	22	38	54	70	134
Gray	7	23	39	55	71	135
Black	8	24	40	56	72	136
Lt. Blue	9	25	41	57	73	137
Lt. Green	10	26	42	58	74	138
Lt. Cyan	11	27	43	59	75	139
Lt. Red	12	28	44	60	76	140
Lt Purple	13	29	45	61	77	141
Yellow	14	30	46	62	78	142
White	15	31	47	63	79	143

Other special color codes:
259 - Chrome (flat surfaces)
260 - Chrome (smoothed)
256 - Invisible (shows details)
257 - Invisible (darkens things it covers)
258 - Invisible (brightens things it covers)

Fig. F.1: The Modeler 3D and VideoScape 3D color chart.

APPENDIX

The Color Chart

Index

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Los Angeles, CA